A Review of the Systematics and a Proposed Scheme of Internal Classification of the New World Subgenus *Melanoconion* of *Culex* (Diptera, Culicidae)[1,2]

S. Sirivanakarn

Department of Entomology
Smithsonian Institution
Washington, D. C. 20560

ABSTRACT. This review of the New World subgenus *Melanoconion* of *Culex* includes taxonomic history, previous schemes of internal classification, revised subgeneric characters, summaries of bionomics, medical importance and distribution, discussions of included species, diagnostic features for separating *Melanoconion* from other related subgenera of *Culex*, its affinities and phylogenetic relationships. The taxonomic characters used are discussed and figured, followed by a detailed outline of the proposed scheme of internal classification, keys to sections, groups and/or subgroups and definitions of sections. A conspectus of taxonomic changes, including 2 transferred taxa, 10 provisionally rejected names and 5 new synonyms, is appended. Based on the study of types and/or available topotypic material, the male genitalia of 6 valid species are figured: *phlabistus, saramaccensis, creole, pifanoi, idottus* and *ernsti*.

INTRODUCTION

Among the major groups of New World mosquitoes, the genus *Culex*, subgenus *Melanoconion* is very important as it contains species which are natural or potential vectors of various arboviruses, including Venezuelan Equine Encephalomyelitis (Aitken et al. 1968, 1969; Galindo et al. 1966; Galindo and Srihongse 1967; Galindo and Grayson 1971; Galindo 1978). However, since the pioneer studies by Rozeboom and Komp (1950) and Foote (1954), little progress has been made in the systematics of the whole subgenus. During this period, some 60 additional species were described but only a few local or restricted studies of certain groups were made (Galindo 1969; Duret 1969c; Belkin, Heinemann and Page 1970). When I initiated a revision of the medically important *Melanoconion* species during 1976-1977, I soon found that most of the species in the subgenus were very inadequately known and that nearly every

---

[1]This work was supported by Research Grant DEB-8108616 from the National Science Foundation and in part by the Smithsonian Fluid Research Funds and the U. S. Army Medical Research and Development Command, Research Contract DAMD-17-74-C-4086.

[2]The opinions, findings and conclusions or recommendations expressed herein are those of the author and do no necessarily reflect the views of the supporting agencies.

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
1982		**00-00-1982 to 00-00-1982**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
A Review of the Systematics and a Proposed Scheme of Internal Classification of the New World Subgenus Melanoconion of Culex (Diptera, Culicidae)	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Smithsonian Institution,Department of Entomology ,Washington,DC,20560**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
see report

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**69**	

aspect of the systematics was in a very confused state. Because of this situation, both taxonomic and nomenclatural problems have been frequently encountered in identifying specimens to species or even to subgenus. With the extensive collections of numerous reared specimens from the project "Mosquitoes of Middle America" (Belkin et al. 1965) and the large number of the types at the U. S. National Museum, my study has been expanded to cover the entire subgenus and related subgenera. As a result of this study, additional significant data on the morphology of the adults and immatures have been obtained. Part of this study dealing with the comparative female cibarial armature has been published (Sirivanakarn 1978b).

The present paper is a preliminary review of the fundamental aspects of the systematics of *Melanoconion*. To provide a basis for further study of the species on a geographic or group level, the subgenus is characterized and a scheme of internal classification based on the morphology of adults and immatures is proposed. Also included in this review are my conclusions on the current status of 23 nominal taxa whose types and/or available topotypic material I have examined during the course of this study. The terminology used in the descriptions, taxonomic discussions and keys generally follows Harbach and Knight (1980, 1981) except for the special terms used in describing certain elements of the male genitalia, which follow that of Sirivanakarn (1979) and Sirivanakarn and Heinemann (1980).

I am most grateful to the late Dr. John N. Belkin for stimulating discussions, advice, assistance and encouragement prior to his untimely death in April 1980. In memory of Dr. Belkin, this paper is dedicated to him.

I thank Sandy Heinemann for considerable preliminary work on the preparation and tentative identification of the *Melanoconion* material in the collection of the project "Mosquitoes of Middle America", without which this work could not have been accomplished in the short time available. I also thank the following individuals and institutions for assistance provided for this study: S. Dillon Ripley, Secretary, Smithsonian Institution, for his support of my field work in Brazil and Argentina through the approval of Fluid Research Funds; Drs. A. J. Shelley and Archibaldo Galvao, Instituto Oswaldo Cruz, Rio de Janeiro; O. P. Forattini, Faculdade de Higiene e Saude Publica, Universidade de Sao Paulo; Oscar de Souza Lopes and Lia de Abreu Sacchetta Lopes, Instituto Adolfo Lutz, Sao Paulo, Brazil; Jose Pedro Duret, Buenos Aires, Argentina; and Pedro Galindo and A. J. Adames, Gorgas Memorial Laboratory, Panama, for their courtesy during my visit at their institutions. Finally, I am indebted to Bruce A. Harrison, Thomas J. Zavortink and Donald Messersmith for reviewing the manuscript, Vichai Malikul for illustration of figures 1-4 and 8, 9, Walter R. Brown for preparation of scanning electron micrographs of detailed adult features (Figs. 5-8), Dr. Maria Paiva de Almeida, Laboratorio Central, Sucam, Garanhuns, Pernambuco, Brazil for her assistance in translating Peryassu's original description (in Portugese) of *chrysothorax* and Gale Munro for typing the preliminary and final drafts.

SYSTEMATICS

TAXONOMIC HISTORY

The status of *Melanoconion* underwent several changes in interpretation and taxonomic treatment from 1906 until 1950 when the subgeneric concept of the group as a whole became more stabilized. For an understanding of certain fundamental aspects of the systematics of this large and difficult subgenus, an account of its historical development is summarized below.

Melanoconion was originally proposed as a distinct genus by Theobald (1903) separated from the genus *Culex* primarily in the adults by the broad squamous scales of the wings and included 6 nominal species: *atratus* Theobald 1901, *humilis* Theobald 1901, *rima* Theobald 1901 (currently transferred to the Old World *Culex*, subgenus *Eumelanomyia* Theobald 1909), *indecorabilis* Theobald 1903, *luteopleurus* Theobald 1903 and *spissipes* Theobald 1903. Later, Dyar (1905) studied the male genitalia of *atratus* and selected this species as the type of *Melanoconion*. Dyar and Knab (1906) synonymized *Melanoconion* with the genus *Culex* and proposed *Mochlostyrax* as a distinct genus with *caudelli* Dyar and Knab 1906 as its type. The latter was recognized only in the larva by the presence of a single row of spinelike comb scales. In Howard, Dyar and Knab (1915), both *Melanoconion* and *Mochlostyrax* were considered synonyms of *Culex* without recognition even as groups. Subsequently, Dyar (1918a), in his comparative study of the male genitalia, restored *Melanoconion* and *Mochlostyrax* as subgenera of *Culex*. In the same paper, Dyar also proposed *Choeroporpa* as a subgenus of *Culex* with *anips* Dyar 1916, as type. Included within *Choeroporpa* were most of the species he earlier placed in *Culex* or *Mochlostyrax*. While there was considerable confusion in the subgeneric placement of the species, Dyar (1918b) recognized *Helcoporpa* as another subgenus with *menytes* Dyar 1918, as type. This was followed by the restoration of *Gnophodeomyia* Theobald 1905 (type species: *inornata* Theobald 1905) as a subgenus with the proposal of *Anoedioporpa* as a replacement name for subgenus *Isostomyia* Coquillett 1906 (Dyar 1923).

In the "Mosquitoes of the Americas", Dyar (1928) made significant changes in his treatment of *Melanoconion* and *Mochlostyrax*. In this monograph, only *Melanoconion* and *Mochlostyrax* were considered as subgenera of *Culex*. The previously recognized subgenera *Choeroporpa* and *Helcoporpa* and the newly recognized *Dinoporpa* (type-species: *trifidus* Dyar 1921) were reduced to sections of *Mochlostyrax*; *Tinolestes* Coquillett 1906 (type-species: *latisquama* Coquillett 1906), *Gnophodeomyia* and *Anoedioporpa* to sections of *Melanoconion*, in which he also included *americanus* (Neveu-Lemaire) 1902 and *antillummagnorum* Dyar 1928 of the subgenus *Micraedes* Coquillett 1906.

In the subgeneric classification of New World *Culex* by Edwards (1932), the interpretation and arrangement of species of *Melanoconion* and *Mochlostyrax* were different from that of Dyar (1928). In Edwards' treatment, *Melanoconion* was considered as a subgenus with *Gnophodeomyia*, *Asebeomyia* Aiken 1911 (type species: *Cx. epirus* Aiken 1909), *Tinolestes*, *Choeroporpa*, *Helcoporpa* and *Dinoporpa* as its synonyms; the subgenus *Mochlostyrax* was restricted to the species in the *Mochlostyrax* section of Dyar (1928); *Anoedioporpa* was synonymized with the subgenus *Isostomyia* (currently transferred to *Trichoprosopon*), and *americanus* and *antillummagnorum* were transferred to the subgenus *Micraedes*. During the same year Komp and Curry (1932) proposed *Upsiloporpa* as

a new subgenus of *Culex* for their new species *haynei*. Later, Komp (1935) found this species to be the same as *menytes* Dyar 1918 and in consequence *Upsiloporpa* became another synonym of *Melanoconion*.

In the thirties and forties, Edwards' classification was largely followed (Senevet and Abonnenc 1939, Lane 1939, Floch and Abonnenc 1947) except for the transfer of *ocellatus* Theobald 1903 from *Microculex* Theobald 1907 to *Melanoconion* by Lane and Whitman (1943).

The most important contribution to the stability of the subgeneric concept of *Melanoconion* occurred when Rozeboom and Komp (1950) treated both *Melanoconion* and *Mochlostyrax* as a single subgenus with excellent illustrations of the male genitalia of some 90 species. In the "Neotropical Culicidae" by Lane (1953), the subgeneric treatment of Rozeboom and Komp was largely followed except for the resurrection of *Tinolestes* from *Melanoconion* as a separated subgenus, to include those species with a short palpus in the males. Immediately following Rozeboom and Komp's study, Foote (1954) found the larvae of the species of *Mochlostyrax* distinct from those of *Melanoconion*, leading him to consider it as a separated subgenus. Eventually Foote's recommendation was adopted in the mosquito catalog of Stone, Knight and Starcke (1959). More recently, however, Belkin (1968) and Belkin, Heinemann and Page (1970) again considered *Melanoconion* and *Mochlostyrax* to form a single subgenus. In brief, Belkin (1968) transferred *breviculus* Senevet & Abonnenc 1939 and *cauchensis* Floch & Abonnenc 1945, previously assigned to *Tinolestes* by Lane (1953), to *Melanoconion* and reinterpreted the subgenus *Tinolestes* to include only *latisquama*. These changes and others recommended by Belkin have currently been adopted in the revised mosquito catalog of Knight and Stone (1977) and in the recent revisions of *Aedinus*, *Tinolestes* and *Anoedioporpa* by Berlin and Belkin (1980).

In the present review, *Melanoconion* is considered as a subgenus of *Culex* largely in the sense of Rozeboom and Komp (1950), Belkin (1968) and Belkin, Heinemann and Page (1970). It primarily contains species with a long palpus in the male and includes most nominal species currently listed in the catalog (Knight and Stone 1977) and its supplement (Knight 1978). The only exceptions are 2 transferred taxa, 10 provisionally rejected names and 5 new synonyms as indicated in the discussion of included species.

PREVIOUS SCHEMES OF INTERNAL CLASSIFICATION

Previous attempts at a broad scheme of classification of *Melanoconion* were by Dyar (1928), Edwards (1932) and Rozeboom and Komp (1950). However, due to changes in the subgeneric treatment of *Melanoconion* involving repeated resurrection and synonymy of several generic group taxa, the schemes developed by these authors are extremely confusing and in need of improvement. Since certain characters used and the grouping of species established by these authors have been found to be of some significance in developing the new scheme proposed here, their classifications are briefly discussed below.

In treating the subgenera *Mochlostyrax* and *Melanoconion*, Dyar (1928) recognized 8 sections (4 in each subgenus), based largely on the shape of the gonostylus of the male genitalia and to a certain extent on the type of larval comb scales. The 4 sections recognized in the subgenus *Mochlostyrax* were: *Dinoporpa* with *trifidus*, *Helcoporpa* with *menytes* (currently = *spissipes*),

Mochlostyrax with *caudelli* and 5 other related nominal taxa, and *Choeroporpa* with some 69 nominal taxa. The 4 sections recognized in the subgenus *Melanoconion* were: *Tinolestes* with *latisquama*, *Gnophodeomyia* with *aikenii* (currently = *ocossa and panocossa*), *Melanoconion* with *atratus* and 8 other nominal taxa, and *Anoedioporpa* with *conservator* and 6 other related nominal taxa. All of these sections except *Choeroporpa* and *Melanoconion* are natural groups and 2 of these (*Tinolestes* and *Anoedioporpa*) have been elevated to subgeneric rank by Belkin (1968) and Berlin and Belkin (1980). The sections *Choeroporpa* and *Melanoconion* are, on the other hand, largely composite and artificial, consisting of several unrelated forms not further classified by Dyar.

In Edwards' scheme (Edwards 1932), the subgenus was subdivided into 3 groups on the basis of certain conspicuous characters of the adults. These are: Group A with *taeniopus* and 3 other nominal taxa, characterized by the narrow scales on the vertex and presence of tarsal markings on at least the hindleg; Group B with *chrysonotum*, *spissipes* and 5 other nominal taxa, characterized by the narrow scales on the vertex, the dark tarsi and anterior half of scutum covered with golden scales; and Group C with some 70 included species, characterized by the broad scales on the vertex, the dark tarsi and the entirely dark scales on the scutum.

The classification by Edwards is artificial as pointed out by Rozeboom and Komp (1950). None of the 3 groups Edwards recognized reflect the true relationships that are evident when a classification is based on the male genitalia. The scheme developed by Rozeboom and Komp was largely adopted from that of Dyar. The only significant change from that of Dyar was in combining both *Melanoconion* and *Mochlostyrax* into a single subgenus. Within the subgenus, all the sections except *Anoedioporpa* (*Melanoconion*, *Tinolestes*, *Gnophodeomyia*, *Dinoporpa*, *Helcoporpa*, *Choeroporpa* and *Mochlostyrax*) and their included species that were originally established by Dyar on the basis of the male genitalia were retained. As indicated in Dyar's scheme, the various species in the *Choeroporpa* and *Melanoconion* sections are obviously not closely related, but no further attempt was made by Rozeboom and Komp to recognize any of these as groups or subgroups.

Since Rozeboom and Komp, two species groups have been recognized and defined. One of these was by Galindo (1969) who recognized the *Culex spissipes* group on the basis of the male genitalia and larval characters while the other was by Duret (1969c) who recognized the *ocellatus* group on the basis of distinctive adult features and male genitalia. Both of these groups are redefined in the broad scheme of classification proposed in this study.

SUBGENERIC CHARACTERS

Based on the morphology of the adults and immatures of *atratus*, the type-species of *Melanoconion*, and various other species, the subgenus is characterized as follows:

FEMALES. In general as figured for *atratus* (Fig. 1). Usually small or medium sized, wing length ranging from 2-3 mm. *Head.* Decumbent scales on vertex varying from narrow, linear or crescent shaped in center to entirely broad, ovate; erect scales numerous, usually entirely dark, sometimes pale whitish or partially pale golden. Palpus and proboscis entirely dark; palpus 0.16-0.20 of proboscis length; antenna as long as proboscis. *Thorax.* Acro-

stichal setae on scutum absent (except *spissipes*); scutal integument usually dark brown to nearly black, sometimes pale brown or yellowish brown; antealar and supraalar areas without dark rounded spots (except *ocellatus* and related species); scales on anterior half of scutum usually entirely dark, infrequently partially pale golden, producing a distinct pattern. Antepronotum with row of setae only, scales absent. Pleural integument usually slightly paler or concolorous with scutum, sometimes pale white or yellow, contrasting with that of scutum; scale patch present on lower posterior surface of mesokatepisternum, present or absent on upper corner and upper median area of mesanepimeron; metameron without microsetae. *Legs*. All segments usually without conspicuous coloration or entirely dark, sometimes with white knee spots on apices of femora and/or white rings at joints of hindtarsomeres 1-5. *Wing*. Plume scales on all wing veins usually short, broad ovate or squamous, rarely long, narrow, linear or clavate. *Abdomen*. Terga II-VII usually with distinct basolateral pale spots or sometimes with complete basal pale bands, rarely entirely dark scaled.

FEMALE CIBARIAL ARMATURE. As figured for *atratus* (Fig. 3). Cibarial dome triangular or ovoid, dark-pigmented and strongly denticulate; cibarial teeth 3-12, all large, columnar, hollow, sometimes more numerous, narrow, entirely pigmented.

MALES. In general as described for females. *Head*. Palpus long, exceeding proboscis by at least 0.5 of palpomere 5, infrequently slightly shorter than or subequal to proboscis; palpomeres 4,5 moderately to strongly plumose, rarely non-plumose. Flagellar whorls of antenna usually strongly plumose; secondary whorls of short setae distad of normal whorls not developed.

MALE GENITALIA. Variously modified, with the following subgeneric characters. *Segment VIII*. Caudal margin of tergum shallowly to deeply emarginate. *Segment IX*. Shape, size and setae of tergal lobe variously developed. *Gonocoxite*. Usually conical- comma shaped, sometimes broad ovoid, globose, oblong or rectangular. *Subapical Lobe*. Proximal and distal divisions strongly developed, widely separated, each with basal columnar stem of varied length; columnar stem of proximal division distally divided or undivided, bearing on its apex 2 curved or straight rodlike setae; columnar stem of distal division shorter than or sometimes as long as proximal, bearing on its apex 1 large hooked rod, 2 acute bladelike setae, 3,4 densely packed foliforms and/or 1 or more variously modified leaves. *Gonostylus*. Varying from simple sickle-shaped to strongly modified. *Phallosome*. Aedeagus usually without sclerotized upper tergal bridge connecting the 2 lateral plates; lateral plate in lateral aspect with narrowly or broadly sclerotized basal hook, its distal part simple with apex tapering into single point or broadly expanded tergally and sternally, forming simple pointed or bifurcate tipped apical tergal process, median conical, quadrate process and/or sternal hooked spine. *Proctiger*. Apical crown usually with a comblike row of 5-12 flattened, apically blunt or pointed teeth; paraproct narrow; cercal sclerite largely membranous; basolateral sclerotization broad triangular, oval or digitiform.

PUPAE. In general as figured for *atratus* (Fig. 3) with the following subgeneric characters. Pigmentation of integument usually pale, cream-colored, sometimes brown or yellow. *Trumpet*. Meatus varied in length,

usually cylindrical, sometimes slightly modified; pinna narrow or broad oblique, with distinct meatal slit extending from its ventral margin to 0.3-0.5 of trumpet length, rarely absent. *Cephalothorax*. Seta 8-C usually 4-6 branched, sometimes double or triple, rarely single. *Metanotum*. Seta 10-C usually multiple, sometimes 3-5 branched; 11-C single or double. *Abdomen*. Setae 5-IV-VI at least double or usually more branched; 6-III-VI usually 3-5 branched, sometimes single or double; 9-VIII placed at caudolateral angle of segment VIII or removed cephalad. *Paddle*. Broad, obovate; outer margin without fringe of hairlike spicules; setae 1,2-P present, usually moderately to well developed.

LARVAE. In general as figured for *atratus* (Fig. 4) with the following subgeneric characters. *Head*. Broader than long, usually with prominent lateral ocular bulge; seta 2-C usually absent, sometimes present; 5-C weakly to strongly developed, single or branched; 6-C long, always single. Antenna usually as long as or slightly shorter than head length, sometimes length and thickness reduced; seta 1-A usually large and strongly plumose, rarely reduced. *Thorax*. Spiculation usually present, lightly to strongly developed, sometimes absent; setae 7,8-P well developed; 7-P usually triple (2-6); 8-P usually double (1-6). *Abdomen*. Spiculation weaker than on thorax; setae 6-I,II usually double, sometimes triple; 7-I usually single, sometimes double. Comb scales usually numerous, forming patch, all subequal or differentiated in size, with normal fringe of fine spicules, sometimes relatively few, enlarged, spinelike, forming patch or arranged in a single row. *Segment VIII*. Setae 1,2 usually with basal sclerotized plate. *Siphon*. Tubular, distally tapering, length varied, usually ranging between 0.8-1.2 mm, sometimes shorter or longer; pecten teeth 8-16, in a close-set row, rarely widely spaced, usually with fine barbs of numerous denticles; subventral tufts 3-8 pairs, moderately to strongly developed, length varied from about as long as to 2-6 times longer than siphon width at points of insertion, usually inserted beyond pecten to about 0.75 of siphon length from base, sometimes placed inside pecten to almost at apex of siphon; dorsolateral setae usually 2 pairs, sometimes 3 or 4, scattered between 0.3-0.75 of siphon length; 2-S usually well developed and apically hooked, usually with submedian accessory spine; dorsal and ventral valves of spiracular apparatus well developed; median caudal filament present or absent. *Anal Segment*. Saddle complete, attached acus absent; caudolateral margin lightly spiculate, sometimes practically bare or with dense row of several long spines; ventral brush (4-X) with 5,6 pairs of setae.

BIONOMICS

As far as known, almost all *Melanoconion* species are groundpool breeders. The only exceptions are *ocellatus* and 3 other related species whose breeding sites are exclusively in leaf axils of epiphytic bromeliads. Eggs are laid singly or in a batch. Both pupae and larvae of groundpool forms have been collected from a variety of habitats, including pools in forest or jungle swamps under heavy shade, artificial or natural ponds, marshes, lakes, margin of slowly moving rivers and canals, partially shaded or exposed to full sunlight. The elevation usually ranges from near sea level to 50 m. Only one species (*taeniopus*) has been known to breed in underground water of coral limestone rock or in borrow pits at bases of trees. The jungle groundpool habitats usually contain fallen leaves, branches and roots of trees, whereas those in open areas, such as marshes, ponds, lakes or canals, usually contain floating pistia, reeds and other aquatic vegetation. Immatures of certain

species are very difficult to find. Adults have frequently been collected in numbers while resting during the day on fallen leaves, tree trunks, moist soil and emergent vegetation. Several species have also been taken in numbers from light and animal baited traps. They are nocturnal in activity and several species have been known to feed on blood of a variety of vertebrates (birds, lizards, mice, man).

MEDICAL IMPORTANCE

As far as known the following species are important as natural or potential vectors of Venezuelan Equine Encephalomyelitis and various other strains of arboviruses: *taeniopus, ocossa, panocossa, pedroi, vomerifer, portesi, delpontei* and *crybda* (Galindo 1978; Aitken and Galindo 1966; Aitken et al. 1968, 1969; Degallier et al. 1978, 1979; Cupp, Scherer and Ordonez 1979; Sirivanakarn and Jakob 1981b).

DISTRIBUTION

Melanoconion is primarily neotropical in distribution with the greatest number of species occurring in Middle America which, in the sense of Belkin et al. (1965), includes Central America, the West Indies and the northern part of South America north of the Amazon river. The entire reported range covers a considerably broader area, extending from the southern part of the United States southward through all the countries in Central America, South America east of the Andes and islands of the West Indies. Its southern limit extends from the east coast of Sao Paulo, Brazil through Paraguay to the west as far as Buenos Aires Province, Argentina. On the Pacific side west of the Andes, the subgenus extends from Colombia southward as far as Peru.

DISCUSSION OF INCLUDED SPECIES

In the mosquito catalog of Knight and Stone (1977) and its supplement by Knight (1978), about 162 species are listed under *Melanoconion*. Since then, some corrections, including revalidation, synonymy and descriptions of new species have been made by Sirivanakarn (1978a, 1979), Sirivanakarn and Belkin (1980), Sirivanakarn and Degallier (1981), Sirivanakarn and Galindo (1980) and Sirivanakarn and Jakob (1979, 1981a). As a result, the total number of taxonomically valid species was then adjusted to 165. In addition, after further study of types and topotypic material and a critical analysis of the original and subsequent descriptions, I am making the following taxonomic changes, thus reducing the total number of valid species to 149.

(1) *Transferred Taxa*. I have examined topotypic specimens of *breviculus* Senevet & Abonnenc 1939 and a male paratype of *cauchensis* Floch & Abonnenc 1945 and found that both are more closely related to *latisquama* of the subgenus *Tinolestes* (Berlin and Belkin 1980) than to any *Melanoconion* species. This is evident from the following combination of characters: (1) male palpus is about half the length of the proboscis; (2) flagellomeres of male antenna with a distinct secondary whorl of short setae distad of normal whorl; (3) metameron with a group of several microsetae and (4) apical crown of proctiger with over 20 densely packed teeth. Other general adult features, such as the yellow pleural integument, the general facies, the relatively sparse long setae of the flagellar whorls, the type of decumbent scales on the vertex and the type of wing scales all indicate that both taxa belong to *Tinolestes*

instead of *Melanoconion*. On this basis, I therefore transfer them to that subgenus. For comparative purposes, certain characters of the male genitalia of these 2 species are illustrated in Fig. 10,13,14,17,19 and 20.

(2) *Rejected Names*. These include 10 nominal taxa whose identity cannot be determined either from the examination of the existing types or from the original descriptions. Most of these species were previously assigned to species of uncertain position or validity by Rozeboom and Komp (1950:98), because their male genitalia were unknown. It appears most likely that these forms were described under other names, but this cannot be determined with any degree of certainty. To avoid possible confusion in taxonomy and nomenclature of *Melanoconion*, I chose at this time to provisionally reject these names by assigning them to 2 categories: taxa dubia and nomina dubia as discussed by Smith (1970). I am also recommending that these names should not be used until the specimens from the type-localities are recovered and definitely proved to be conspecific with the types.

(a) *Taxa Dubia*. Falling into this category are the following nominal taxa: *humilis* Theobald 1901, *nigricorpus* (Theobald 1901), *indecorabilis* (Theobald 1903), *nigrescens* (Theobald 1907), *fasciolatus* (Lutz 1904), *lugens* Lutz 1905, *gravitator* Dyar & Knab 1906 and *decorator* Dyar & Knab 1906. The primary types (holotypes, lectotypes) of *humilis*, *nigricorpus*, *indecorabilis*, *nigrescens* and *lugens* are still in existent but those of *fasciolatus*, *gravitator* and *decorator* were lost and could not be located at the institutions where they were reported to be deposited (Belkin 1968; Belkin, Schick and Heinemann 1971). The types of *nigricorpus* and *indecorabilis* are pinned females only but those of *humilis* and *nigrescens* are males with their genitalia missing or presumably lost. The figure of the male genitalia of *nigrescens* in Rozeboom and Komp (1950, Pl. X, 57) is, in fact, that of *clarki* Evans 1924 while the figure for this species in Lane (1953:480-481) most probably applies to that of *implicatus* Senevet & Abonnenc 1939. The syntype male of *lugens* and the male genitalia were in extremely poor condition and it was not possible to determine its identity. A critical examination of the existing types and analysis of the original descriptions have shown that all of these taxa are typical of *Melanoconion*, but none can be associated with any known members in the subgenus.

(b) *Nomina Dubia*. Included in this category are 2 nominal taxa: *chrysothorax* (Peryassu) 1908 and *epirus* Aiken 1909 whose types are non-existent and their identity as determined from the original description has shown that both are probably members of other *Culex* subgenera instead of *Melanoconion*. The lectotype male of *chrysothorax* designated by Belkin (see Belkin, Schick and Heinemann 1971:23) at the Instituto Oswaldo Cruz, Rio de Janeiro, Brazil was later found to be lost when Belkin and I visited that institution in January of 1980. From a detailed translation of the entire original description by Peryassu (1908), I finally concluded that *chrysothorax* is most probably a *Microculex* because of the following descriptive features: (1) male palpus with 4 white rings at bases of palpomeres 2-5; (2) scutum with 3 longitudinal white stripes alternating with dark stripes; (3) antepronotum covered with white narrow scales and (4) tarsi with basal white rings. In addition, the description and the photograph of the *chrysothorax* larva and notes on the breeding sites (bromeliads, marshy area) by Peryassu also suggest that the specimens before him were a *Microculex*, most probably a member of the *imitator* series of Lane and Whitman (1951). Since it has not been possible to associate *chryso-*

thorax with any known members of *Microculex*, I therefore relegate it to a nomen dubium. The same conclusion is also made for *epirus*, originally described as *Culex* by Aiken (1909), but later the author placed it in a distinct genus with a combination *Asebeomyia epirus* (Aiken 1911:193, footnote). From Aiken's notes, it is most likely that *epirus* is *Cx. quinquefasciatus* Say because of the following statements: "To the genera above described two new ones will probably fall to be added. One is domestic species which came near *Gnophodeomyia* but has the femora swollen apically and basally as in *Melanoconion*... The larvae are found in house, in cistern and bath water and the adults have a peculiarly disrespectful affection for tender integument, the lips, nostrils and other exposed mucous membrane receiving their attention. The name *Asebeomyia* would be proper for this new genus. Into this genus will come my *Culex epira* (B.G. Medical Annual for 1908, p. 8)." Because of the dubious subgeneric status of *epirus*, I also consider the name *Asebeomyia* as a nomen dubium with a recommendation that it should be eliminated from the current synonymy with *Melanoconion*.

(3) *New Synonyms*. Based primarily on the study and comparison of the types and/or available topotypic material, the following nominal taxa are considered as new synonyms: (1) *kerri* Duret 1968 (=*phlabistus* Dyar 1920); (2) *implicatus* Senevet & Abonnenc 1939 is transferred from the previous synonymy of *nigrescens* (Theobald 1907) by Lane (1951, 1953) and Casal (1963) to the synonymy of *saramaccensis* Bonne-Wepster & Bonne 1919(1920); (3) *seneveti* Clastrier 1970 (=*contei* Duret 1968); (4) *thomasi* Evans 1924 (=*bastagarius* Dyar & Knab 1906) and (5) *venezuelensis* Anduze 1948(1949) (=*simulator* Dyar & Knab 1906).

(4) *Identity of 6 valid species*. The identity of the following 6 species is extremely difficult to determine from the original and/or subsequent descriptions and figures of the male genitalia. To alleviate this problem, the male genitalia, primarily from the types of these species are illustrated in Fig. 23, 24 and 25. These species are: *phlabistus* Dyar 1920, *saramaccensis* Bonne-Wepster & Bonne 1919(1920), *creole* Anduze 1948(1949), *pifanoi* Anduze 1948(1949), *idottus* Dyar 1920 and *ernsti* Anduze 1948(1949). These species can be distinguished readily from the rest of *Melanoconion* by comparing the figures of the male genitalia with those in Rozeboom and Komp (1950) and in the subsequent publications by Komp and Rozeboom (1951), Galindo and Blanton (1954), Galindo and Mendez (1961), Duret (1954-1969), Duret and Barreto (1956), Clastrier (1968-1972) and other recent authors.

DISCUSSION OF DIAGNOSTIC CHARACTERS

The majority of *Melanoconion* species can generally be separated from most species of related subgenera of *Culex (Aedinus, Anoedioporpa, Belkinomyia, Carrollia, Micraedes, Microculex, Tinolestes)* in all stages by the keys recently published by Berlin and Belkin (1980:3-6). However, because of several overlaps in the characters of one or more stages of these subgenera, it is important that identification should be based on at least 2 or more characters in each stage. Caution should be taken in relying on the broad decumbent scales on vertex of the adult head in couplet 10(9) of Berlin and Belkin's key, since this character largely applies to the species in the Melanoconion section only, but not to those in the Ocellatus and Spissipes sections (see proposed scheme and keys to sections). The following is a summary of diagnostic characters that will separate most *Melanoconion* species

from members of related subgenera.

(1). In the *adults*, the females can be readily separated from *Carrollia* by the absence of metallic coloration on the legs and terga of the abdomen; from *Micraedes* and *Microculex* by the absence of acrostichal setae (except *spissipes*), the darker scales and integument of the scutum, the absence of narrow scales on antepronotum, the usually broader plume scales on wing veins and tarsal marking if present, embracing both ends of tarsomeres 2-4, whereas in *Microculex*, this marking is entirely basal; from *Belkinomyia* by the presence of basolateral whitish spots on abdominal terga II-VII and the absence of microsetae at base of halter; from *Aedinus* by the coarser and relatively sparse scutal scales and the usually dark or blackish integument of the scutum versus tan or reddish-brown in *Aedinus*; from *Anoedioporpa* by the absence of scales on antepronotum, the broader and shorter plume scales of wing veins and the generally darker scutal and pleural integument; and from *Tinolestes* by the dark versus tan brown antepronotum and the absence of microsetae on metameron.

The males of *Melanoconion* can easily be separated from *Aedinus*, *Anoedioporpa*, *Belkinomyia*, *Micraedes* and *Tinolestes* by the longer palpus which is at least 0.75 to longer than proboscis length, whereas in all of these related subgenera, the palpus is reduced to 0.16 to at most 0.5 of proboscis length; and from *Microculex* and *Carrollia* by the same characters given above for the females.

(2). In the *male genitalia*, *Melanoconion* can be readily separated from *Aedinus*, *Belkinomyia*, *Micraedes* and *Microculex* by the elongated columnar stems of proximal and distal divisions of the subapical lobe and the variously developed distal part of the lateral plate of the aedeagus; from *Anoedioporpa* by the presence of scales on basal tergal surface of the gonocoxite and the usually well developed tergal lobe of segment IX; from *Carrollia* by the presence versus the absence of distal division of the subapical lobe and different modifications of the gonostylus; and from *Tinolestes* by the reduction in the number of teeth on the proctiger crown, which range from 5-12 versus 20 or more in *Tinolestes*.

(3). In the *pupa*, all *Melanoconion* species except *ocellatus* and related forms can be readily separated from related subgenera by the presence of a distinct meatal slit or cleft extending from the pinna of trumpet and by the several branched abdominal setae 1,5-III-VI.

(4). In the *larva*, *Melanoconion* can be separated from *Aedinus* by the absence of acus attached to the anal saddle and the usually longer and narrower pecten teeth of the siphon; from *Anoedioporpa* and *Tinolestes* by the presence versus the absence of a distinct basal sclerotized plate of setae 1,2-VIII and the serrated versus the unserrated pecten teeth of the siphon; from *Belkinomyia* by the usually well developed seta 1-III-VI of the abdomen and the usually strongly developed subventral tufts of the siphon; from *Carrollia* by the tubular versus fusiform shape of the siphon, the longer and thicker antennal shaft and the prominent ocular bulge of the head capsule; from *Micraedes* by head seta 6-C single versus triple and non-stellate setae 1,3 of the thorax and abdomen (except *ocellatus* and related species); and from *Microculex* by the strong seta 8-P versus the reduction of this seta and the more strongly developed subventral tufts of the siphon.

AFFINITIES AND PHYLOGENETIC RELATIONSHIPS

As evident in this and previous studies (Sirivanakarn 1978b, Berlin 1969, Valencia 1973, Adames and Galindo 1973, Berlin and Belkin 1980), *Melanoconion* is related to *Aedinus, Anoedioporpa, Belkinomyia, Carrollia, Micraedes, Microculex* and *Tinolestes*. These relationships are evident in the following characters: (1) in the male genitalia, the presence of the so-called "basal hook" of the lateral plate of the aedeagus; (2) in the female cibarial armature, the oval or heart-shaped cibarial dome, which is strongly denticulate, and the development of the cibarial teeth; (3) in the pupa, the position of seta 2-VI which is laterad of seta 1-VI and (4) in the larva, the single seta 6-C, the reduction of seta 3-P and the presence of at least 2 pairs of dorsolateral setae on the siphon. In the Neotropics, this combination of characters is phylogenetically important and provides a clear-cut separation of *Melanoconion* and related subgenera from the rest of *Culex*. Although their relationships have not yet been studied in detail, it is evident that *Melanoconion* and its related subgenera belong to single major monophyletic line unique to the New World. Within this line, *Melanoconion* is the largest and most diverse. It comprises several distinct groups, some of which appear to be generalized and primitive, exhibiting characters in one or more stages overlapping with those of related subgenera. Since the majority of *Melanoconion* species are primarily ground pool breeders whereas, those of the related subgenera are breeders in treehole, bamboo, artificial or natural containers (*Anoedioporpa, Carrollia*), epiphytic bromeliads (*Micraedes, Microculex*) and crabholes (*Tinolestes, Belkinomyia*), it is conceivable that their evolution probably took place primarily through specialization in breeding sites. The mechanism of speciation somewhat resembles that of the *Culex* subgenera *Eumelanomyia* and *Lophoceraomyia* in the Oriental and Indomalayan regions (Sirivanakarn 1972, 1977).

On a broader comparative basis, *Melanoconion* and related subgenera exhibit certain characters similar to the subgenus *Neoculex* of *Culex* and the genera *Galindomyia* and *Deinocerites*. *Neoculex* is worldwide in distribution with only a single species (*derivator*) occurring in the Neotropics, whereas *Galindomyia* and *Deinocerites* are exclusively New World. The similarity with *Neoculex* is evident in the typical comblike row of the proctiger crown of the male genitalia and in the reduction of seta 3-P of the larvae. The similarity with *Galindomyia* and *Deinocerites* is evident particularly in the development of the female cibarial teeth, the type of gonostylus and proctiger crown of the male genitalia. These similarities are obvious particularly in *Belkinomyia* and *Tinolestes* as discussed by Adames and Galindo (1973), Belkin and Hogue (1959), and Adames (1971). Further detailed study of the relationships of these *Culex* subgenera and the genera *Galindomyia* and *Deinocerites* should contribute to a better knowledge of their phylogeny as well as to the improvement of the present classification of the genera and subgenera in the tribe Culicini of Belkin (1962).

TAXONOMIC CHARACTERS

Basic to the proposed scheme of internal classification of *Melanoconion* presented here is the determination of phylogenetic importance of the characters of the adults and immatures. The following is a summary of characters that are important in delimiting and recognizing species groups at various levels.

ADULT CHARACTERS.

Head. The significant characters of the head are: (1) vestiture of decumbent scales in the center of the vertex. As shown in Fig. 5 A-F, the decumbent scales vary from narrow, linear or crescent shaped to entirely broad, ovate and appressed. This character is particularly important in determining sections, but is of limited value at the group or subgroup levels and (2) length of male palpus relative to proboscis. In general, the male palpus in *Melanoconion* exceeds the length of proboscis by at least 0.5 the length of palpomere 5. However, in a few groups, the male palpus is slightly shorter than or subequal to the proboscis. This is significant only in the delimitation of a few primary groups. Other characters of the head, such as the partially pale white decumbent scales, may be significant in defining a few groups and subgroups but are of no value at the section level and for the majority of groups and subgroups. The same applies to the partially golden erect scales of the vertex, which may be of specific diagnostic value, but not significant as a group character.

Thorax. The significant characters of the thorax are: (1) presence or absence of dark round spot on antealar and supraalar areas of the scutum; (2) color of scutal integument, which varies from pale or tan to dark brown or blackish; (3) presence of acrostichal setae, which is significant only in the delimitation of the Spissipes group, whereas this character is absent in all other groups of *Melanoconion*; and (4) presence or absence of scale patches on the upper corner of mesokatepisternum and median surface of mesanepimeron (Fig. 6 A-F). Other characters of the scutum, such as golden scales on its anterior half and partially pale scales on the prescutellar space and scutellar lobes, may be of specific diagnostic value, but are not significant as group characters.

Legs. In general, the legs are entirely dark or without distinctive coloration except for the presence of knee spots on the apices of the femora and/or banding on hindtarsomeres 1-5, which are diagnostic of only a few species and groups.

Wing. The only important character of the wing is the vestiture of the plume scales on veins R_2, R_3 and R_{4+5}, which vary from long, narrow, linear or clavate to short and broad ovate as shown in Fig. 7 A-F.

Abdomen. In general, nearly all groups of *Melanoconion* have distinct basolateral white spots on abdominal terga II-VII. These spots may extend dorsad to form complete basal bands, particularly in the males. However, in one group (Jubifer), these spots and bands are absent or not clearly marked and are therefore significant in the separation of this group.

FEMALE CIBARIAL ARMATURE. As shown in Figs. 8 and 9, the development and number of the cibarial teeth are significant at the group levels, and are sometimes also of specific diagnostic value.

MALE GENITALIA. The various components of the male genitalia are, in practically all cases, of great taxonomic significance. However, in the past only the modifications of the shape of the gonostylus and certain features of the subapical lobe were used (Dyar 1928, Rozeboom and Komp 1950). Based on a

broad comparative study of each element of the male genitalia, the various modifications of the following characters are listed according to the degree of their phylogenetic significance: (1) lateral plate of the aedeagus (Figs. 10, 11, 12); (2) development of the proximal and distal divisions of the subapical lobe (Figs. 14, 15, 16), including also the specialized setae on each division; (3) modifications in the apical half of the gonostylus (Figs. 17, 18); (4) modifications of the tergal lobe of segment IX (Figs. 20, 21, 22) and (5) the general outline or shapes of the gonocoxite (Fig. 13).

PUPA. The characters of phylogenetic importance in the pupa are: (1) position of seta 9-VIII, which is at or near to caudolateral angle of the segment or removed cephalad; (2) branching of seta 11-C; (3) development of seta 5-C; (4) branching of setae 8,9-C; (5) branching of seta 5-IV-VI; (6) branching of seta 3-I-III and (7) branching of seta 6-III-VI. Other features, such as the shape, length of trumpet and presence or absence of a meatal slit extending from pinna of the trumpet are also important at different group levels.

LARVA. The following larval characters, listed in order of importance, are: (1) development of ocular bulge on the head capsule; (2) length and thickness of the antennal shaft; (3) presence or absence of seta 2-C; (4) branching of seta 5-C; (5) position of seta 14-C relative to seta 15-C; (6) branching of setae 7,8-P; (7) branching of seta 4-P; (8) development of seta 1-M, T; (9) branching of seta 7-I; (10) branching of seta 6-I,II; (11) number and type of comb scales; (12) development of subventral tufts of the siphon; (13) number of dorsolateral setae of the siphon; (14) length and shape of the siphon and (15) development of spicules on caudolateral border of the saddle. Most of these characters are significant at the section level but are of less importance at the group or subgroup levels because of considerable overlap possibly due to parallelism or convergence.

PROPOSED SCHEME OF INTERNAL CLASSIFICATION

The first step in this classification is to recognize several primary groups (groups and subgroups). These primary groups are then assembled into major sections on the basis of the type of basal hook of the lateral plate of the male genitalia, the type of decumbent scales in the center of the vertex and other features of the adults, the position of seta 9-VIII of the pupa and certain combinations of larval chaetotaxy as given in the keys. The detailed outline of this scheme and the placement of species into different sections, groups and subgroups are shown below.

Subgenus MELANOCONION

OCELLATUS SECTION: *ocellatus* Theobald 1903, *nigrimacula* Lane & Whitman 1943, *punctiscapularis* Floch & Abonnenc 1946, *flochi* Duret 1969.

SPISSIPES SECTION:

(1) Spissipes group: *spissipes* Theobald 1903
(2) Taeniopus group:
  (a) Taeniopus subgroup: *taeniopus* Dyar & Knab 1907
  (b) Vomerifer subgroup: *vomerifer* Komp 1932, *portesi* Senevet & Abonnenc 1941, *sacchettae* Sirivanakarn & Jakob 1981
  (c) Pedroi subgroup: *pedroi* Sirivanakarn & Belkin 1980,

epanastasis Dyar 1922, *crybda* Dyar 1924, *adamesi* Sirivanakarn & Galindo 1980

(3) Paracrybda group:
  (a) Paracrybda subgroup: *paracrybda* Komp 1936, *delpontei* Duret 1969
  (b) Pereyrai subgroup: *pereyrai* Duret 1967
(4) Ocossa group: *ocossa* Dyar & Knab 1919, *panocossa* Dyar 1923
(5) Jubifer group: *simulator* Dyar & Knab 1906, *jubifer* Komp & Brown 1935
(6) Faurani group: *faurani* Duret 1968
(7) Nicaroensis group: *nicaroensis* Duret 1967
(8) Lopesi group: *lopesi* Sirivanakarn & Jakob 1979

MELANOCONION SECTION:

(1) Atratus group: *atratus* Theobald 1901, *dunni* Dyar 1918, *zeteki* Dyar 1918, *commevynensis* Bonne-Wepster & Bonne 1919(1920), *ensiformis* Bonne-Wepster & Bonne 1919(1920), *caribeanus* Galindo & Blanton 1954, *trigeminatus* Clastrier 1970
(2) Distinguendus group:
  (a) Putumayensis subgroup: *putumayensis* Matheson 1934, *phlabistus* Dyar 1920, *bahiense* Duret 1969
  (b) Distinguendus subgroup: *comminutor* Dyar 1920, *maxinocca* Dyar 1920, *alcocci* Bonne-Wepster & Bonne 1919(1920), *distinguendus* Dyar 1928, *productus* Senevet & Abonnenc 1939, *nicceriensis* Bonne-Wepster and Bonne 1919(1920), *patientiae* Floch and Fauran 1955
  (c) Chrysonotum subgroup: *chrysonotum* Dyar & Knab 1906
  (d) Galindoi subgroup: *galindoi* Komp & Rozeboom 1951
  (e) Rorotaensis subgroup: *rorotaensis* Floch & Abonnenc 1946
(3) Trifidus group: *trifidus* Dyar 1921
(4) Saramaccensis group: *saramaccensis* Bonne-Wepster & Bonne 1919(1920)
(5) Erraticus group:
  (a) Erraticus subgroup: *erraticus* (Dyar & Knab 1906), *invocator* Pazos 1908, *aureonotatus* Duret & Barreto 1956
  (b) Clarki subgroup: *clarki* Evans 1924
  (c) Psatharus subgroup: *psatharus* Dyar 1920
(6) Educator group: *theobaldi* (Lutz 1904), *educator* Dyar & Knab 1906, *inadmirabilis* Dyar 1928,. *rachoui* Duret 1968, *keenani* Galindo & Mendez 1961, *mistura* Komp & Rozeboom 1951, *cristovaoi* Duret 1968
(7) Intrincatus group:
  (a) Intrincatus subgroup: *intrincatus* Brethes 1916, *misionensis* Duret 1953, *johnsoni* Galindo & Blanton 1954, *mutator* Dyar & Knab 1906, *sursumptor* Dyar 1924, *ybarmis* Dyar 1920, *bequaerti* Dyar & Shannon 1925, *quadrifoliatus* Komp 1936, *equinoxialis* Floch & Abonnenc 1945, *rabanicolus* Floch & Abonnenc 1946, *pifanoi* Anduze 1948(1949), *trilobulatus* Duret & Barretto 1956, *trisetosus* Fauran 1961, *silvai* Duret 1968, *milwardi* Xavier & Da Silva Mattos 1972
  (b) Eastor subgroup: *eastor* Dyar 1920
  (c) Idottus subgroup: *idottus* Dyar 1920, *fairchildi* Galindo & Blanton 1954, *ronderosi* De Linero 1967, *ferreri* Duret 1968, *sardinerae* Fox 1953

(d) Tecmarsis subgroup: *tecmarsis* Dyar 1918
(e) Andricus subgroup: *andricus* Root 1927
(f) Penai subgroup: *penai* Sirivanakarn 1979

(8) Bastagarius group:
(a) Bastagarius subgroup: *bastagarius* Dyar & Knab 1906, *tournieri* Senevet & Abonnenc 1939, *coppenamensis* Bonne-Wepster & Bonne 1919(1920), *comatus* Senevet & Abonnenc 1939, *creole* Anduze 1948(1949), *intonsus* Galindo & Blanton 1954
(b) Iolambdis subgroup: *iolambdis* Dyar 1918, *corentynensis* Dyar 1920, *limacifer* Komp 1936, *confundior* Komp & Rozeboom 1951, *quasihybridus* Galindo & Blanton 1954, *bifoliatus* Duret & Barretto 1956, *dureti* Casal & Garcia 1968, *dolichophyllus* Clastrier 1970

(9) Evansae group: *evansae* Root 1927, *batesi* Rozeboom & Komp 1948, *johnnyi* Duret 1968, *changuinolae* Galindo & Blanton 1954

(10) Inhibitator group:
(a) Inhibitator subgroup: *inhibitator* Dyar & Knab 1906, *albinensis* Bonne-Wepster & Bonne 1919(1920), *phlogistus* Dyar 1920, *plectoporpe* Root 1927, *oedipus* Root 1927, *carcinophillus* Dyar & Knab 1906, *flabellifer* Komp 1936, *kummi* Komp & Rozeboom 1951, *wepsterae* Komp & Rozeboom 1951, *bejaranoi* Duret 1953, *orfilai* Duret 1953, *ernsti* Anduze 1948(1949), *vidali* Floch & Fauran 1954, *mesodenticulatus* Galindo & Mendez 1961, *contei* Duret, *ernanii* Duret 1968, *abonnenci* Clastrier 1970, *pavlovskyi* Casal & Garcia 1967, *amitis* Komp 1936
(b) Egcymon subgroup: *egcymon* Dyar 1923, *elephas* Komp 1936, *serratimarge* Root 1927, *isabelae* Duret 1968
(c) Mulrennani subgroup: *mulrennani* Basham 1968

(11) Conspirator group: *conspirator* Dyar & Knab 1906, *elevator* Dyar & Knab 1906, *terebor* Dyar 1920, *dyius* Root 1927, *jocasta* Komp & Rozeboom 1951, *lucifugus* Komp 1936, *madininensis* Senevet 1936, *aliciae* Duret 1953, *martinezi* Casal & Garcia 1968, *olimpioi* Xavier, Da Silva & Da Silva Mattos 1970

(12) Pilosus group:
(a) Pilosus subgroup: *pilosus* Dyar & Knab 1906, *innovator* Evans 1924, *unicornis* Root 1928, *rooti* Rozeboom 1935
(b) Caudelli subgroup: *caudelli* Dyar & Knab 1906, *alogistus* Dyar 1918, *vexilifer* Komp 1936, *lacertosus* Komp & Rozeboom 1951, *foliafer* Komp & Rozeboom 1951, *arboricolus* Galindo & Mendez 1961, *galvaoi* Duret 1968, *garcesi* Duret 1968, *palaciosi* Duret 1968

(13) Peccator group: *peccator* Dyar & Knab 1909, *abominator* Dyar & Knab 1909, *anips* Dyar 1916

KEYS TO SECTIONS, GROUPS AND SUBGROUPS OF MELANOCONION

ADULTS

1. Scutum with pair of large, round black spots on antealar and supra-alar areas; plume scales on veins R_2, R_3 and R_{4+5} of wing long, narrow, clavate or linear (Fig. 7 A, B) . . . OCELLATUS SECTION

Scutum without above character; plume scales on veins R_2, R_3 and R_{4+5} of wing short, broad ovate or squamous (Fig. 7 C-F) 2

2(1). Decumbent scales in center of vertex of head largely or partially narrow, linear or crescent shaped; broad decumbent scales restricted to lateral patch at side of eye (Fig. 5 B-D). . . . 3

Decumbent scales of vertex entirely broad (Fig. 5 E, F) . . MELANOCONION SECTION (in part) 14

3(2). Narrow decumbent scales of vertex numerous, extending from coronal suture to lateral margin; lateral patch of broad scales small, or rather indistinct (Fig. 5 B) . . SPISSIPES SECTION (in part) 4

Narrow decumbent scales of vertex fewer, restricted to small central area along coronal suture; lateral patch of broad scales large, or very distinct (Fig. 5 C, D) 10

SPISSIPES SECTION

4(3). Acrostichal setae present on scutum; *female*: scales on anterior two-thirds of scutum entirely or partially golden, rarely entirely dark . . . . . Spissipes group

Acrostichal setae absent or not developed; *female*: scales on most parts of scutum entirely dark 5

5(4). Erect scales of vertex entirely pale golden or yellow; *male*: palpomeres 4 and 5 non-plumose or with only few weak short setae . . . . . Nicaroensis group

Erect scales of vertex entirely dark, or sometimes partially pale golden in center; *male*: palpomeres 4 and 5 plumose or with several strong bristlelike setae 6

6(5). Abdominal terga II-VII without basolateral pale spots . Jubifer group

Abdominal terga II-VII with distinct basolateral pale spots 7

7(6). Size relatively small, wing length 2.3-2.7 mm; female cibarial teeth minute, entirely dark, about 30 in number (Fig. 8 B) . . . . . Paracrybda group

Size relatively large, wing length usually exceeding 3.0 mm; female cibarial teeth large, columnar, basally hollow or transparent, 10-17 in number (Fig. 8 D-F) . . (Taeniopus group) 8

8(7). Scales on prescutellar area and scutellar lobes partially pale whitish; hindtarsus with white bands at joints of tarsomeres 1-5 . . . . . Taeniopus subgroup

Scales on prescutellar area and scutellar lobes entirely dark; hindtarsus with or without white bands at joints of tarsomeres

1-5 9

9(8). Upper border of mesokatepisternum with an even curved row of 9-12 strong setae; if white bands present on hindtarsus, then apices of all femora with distinct white knee spots . . Pedroi subgroup

Upper border of mesokatepisternum with an irregular row of 7,8 weaker setae; if white bands present on hindtarsus, then apices of all femora without distinct knee spots . . . . . Vomerifer subgroup

10(3). Pleural integument generally light yellowish or nearly whitish, contrasting sharply with dark scutal integument; female cibarial teeth minute, 30-40 in number (Fig. 8 B) . . SPISSIPES SECTION (in part) . . . . . Ocossa group

Pleural integument more or less same color as scutum, if lighter, then with a striking pattern of dark and pale stripes running across mesokatepisternum and mesanepimeron; female cibarial teeth large, hollow, columnar, 5-8 in number (Fig. 8 G-L) . . MELANOCONION SECTION (in part) 11

MELANOCONION SECTION

11(10). Pleural integument with striking pattern of dark and pale stripes; upper corner of mesokatepisternum usually with patch of several pale scales . . . . . Atratus group

Pleural integument without pattern of stripes as above or uniformly brownish; upper corner of mesokatepisternum with or without patch of few pale scales . . Distinguendus group 12

12(11). Anterior two-thirds of scutum largely or entirely golden scaled . . . . . Chrysonotum subgroup

All parts of scutum entirely dark scaled 13

13(12). Upper corner of mesokatepisternum with distinct patch of scales . . . . . Distinguendus subgroup

Upper corner of mesokatepisternum without scales . . . . . Rutumayensis subgroup

14(2). Size minute, wing length usually about 1.5 mm, not exceeding 2.0 mm; *male*: palpus slightly shorter or subequal to proboscis length . . . . . Saramaccensis group

Size large or medium, wing length at least 2.2 mm; *male*: palpus longer than proboscis by at least 0.5 of palpomere 5 15

15(14). Plume scales on wing veins R_2, R_3, and R_{4+5} of wing relatively narrow, clavate; *male*: palpomeres 4 and 5 weakly plumose and short . . . . . Trifidus group

Plume scales on above wing veins usually broad ovate or squamous;

male: palpomeres 4 and 5 moderately to strongly plumose and long 16

16(15). Upper corner of mesokatepisternum with few to several scales forming a distinct patch (Fig. 6 E) 17

Upper corner of mesokatepisternum without scales (Fig. 6 F) . . . 19

17(16). Median surface of mesanepimeron with broad whitish scale patch (Fig. 6 E) . . Erraticus group (in part) . . . . . Erraticus subgroup; Clarki subgroup

Median surface of mesanepimeron without scale patch 18

18(17). *Female*: Cibarial teeth short, broad, hollow, 5-7 in number; cibarial dome small, broad conical (Fig. 9 A); *male*: palpomers 4 and 5 moderatley to strongly plumose . . Erraticus Group (in part) . . . . . Psatharus subgroup, Educator group

Female: Cibarial teeth long, narrow, entirely pigmented, 40-60 in number (Fig. 9 H,I); cibarial dome large, hemispherical; *male*: palpomeres 4 and 5 weakly plumose . . . . . Peccator group

19(16). Decument scales of vertex predominantly pale whitish or grayish; *female*: cibarial teeth 3 in number (Fig. 9 F, G) . . . . . Pilosus group; Intrincatus group (in part), Andricus subgroup

Decumbent scales of vertex partially pale to entirely dark; *female*: cibarial teeth 5 or more in number (Fig. 9, B-E) 20

20(19). Scutal and pleural integument dark brown or black; decumbent scales of vertex entirely dark . . Intrincatus group (in part) . . . . . Tecmarsis subgroup; Intrincatus subgroup

Scutal and pleural integument usually light brown; decumbent scales of vertex usually pale along eye margin, dark toward center 21

21(20). Median posterior surface of mesopostnotum with a distinct patch of microsetae . . . . . Evansae group

Median posterior surface of mesopostnotum without microsetae 22

22(21). Lower posterior part of mesanepimeron usually with a patch of microscopic scalelike setae (Fig. 6 C) . . . . . Bastagarius group

Lower posterior part of mesanepimeron without above character (Fig. 6 F) . . . . . Penai subgroup; Inhibitator group; Conspirator group

MALE GENITALIA

1. Basal hook of lateral plate of aedeagus in lateral aspect broadly sclerotized or in form of broad sternally rounded plate (Fig. 10 A-I) 2

Basal hook of lateral plate of aedeagus narrowly sclerotized or in form of slender curved arm (Fig. 11, 12) . . MELANOCONION SECTION 13

2(1). Distal part of lateral plate tapered into single caudal process only; basal hook rather short and bluntly pointed (Fig. 10 A) . . . . . OCELLATUS SECTION

Distal part of lateral plate with elongate apical tergal process and short hooked or straight apical sternal process (Fig. 10 B-G, I), if not so modified, then basal hook long and broadly rounded on sternal margin (Fig. 10 H) 3

3(2). Apical crown of proctiger large, compact, with dense row of 20 or more teeth (Fig. 19 A) . . . . . *breviculus* and *cauchensis* (here transferred to subgenus TINOLESTES)

Apical crown of proctiger small or moderate in size, with comblike row of 5-15 teeth (Fig. 19 B, D) . . SPISSIPES SECTION 4

SPISSIPES SECTION

4(3). Gonocoxite broad, more or less rectangular (Fig. 13 D); gonostylus with strong dorsal spine in preapical portion (Fig. 17 G); teeth of proctiger crown very thick (Fig. 19 B) . . Nicaroensis group

Gonocoxite slender conical or ovoid (Fig. 13 A, F); gonostylus without preapical dorsal spine as above; teeth of proctiger crown slender (Fig. 19 D) 5

5(4). Preapical portion of gonostylus strongly angulate or upturned (Fig. 17 B); lobe of IX tergum large, hill-like (Fig. 20 G) . . . . . Spissipes Group

Preapical portion of gonostylus normal or not modified as above (Figs. 17 I, K, Fig. 18 A, C); lobe of IX tergum not as above 6

6(5). Apical portion of gonostylus with dense tuft of numerous filaments on ventral surface (Fig. 18 A); proximal division of subapical lobe with peculiar rounded pit ventrad of base of columnar stem . . . . . Lopesi group

Apical portion of gonostylus without above character; proximal division of subapical lobe without rounded pit 7

7(6). Lobe of IX tergum long, digitiform (Fig. 20 H); median apical margin of distal portion of lateral plate convex or rounded . . Taeniopus group (in part) . . . . . Taeniopus subgroup

Lobe of IX tergum short, moundlike or ovoid (Fig. 20 E, F, I, J); median apical margin of distal portion of lateral plate straight or concave 8

8(7). Columnar stem of proximal division of subapical lobe with hyaline sheathlike seta and flat hooked seta adjacent to base of rodlike setae *a* and *b* (Fig. 14 F) 9

Columnar stem of proximal division without above specialized setae 10

9(8). Columnar stem of distal division divided into 2 secondary stalks (Fig. 14 F) . . . . . Paracrybda group

Columnar stem of distal division not divided . . . . . Taeniopus group (in part) . . . . . Pedroi subgroup

10(8). Distal division of subapical lobe with broad leaf (Fig. 14 H); columnar stem of proximal division long and not divided apically . 11

Distal division of subapical lobe without broad leaf; columnar stem of proximal division short and apically divided with base of rods *a* and *b* clearly separated . . . . . Faurani group

11(10). Lobe of tergum IX poorly developed, apical margin flat, with row of 5-7 setae (Fig. 20 F); base of distal division of subapical lobe with petiolate leaf . . . . . Ocossa group

Lobe of IX tergum well developed or not as above (Fig. 20 I, J); base of distal division of subapical lobe with leaf of different shape than above 12

12(11). Goncoxite broad conical; lobe of IX tergum small, oval or mound-shaped (Fig. 20 I, A); subapical crest of gonostylus weakly developed . . Taeniopus group (in part) . . . Vomerifer subgroup

Gonocoxite ovoid or narrow conical; lobe of IX tergum larger, typically oval or broadly prominent (Fig. 20 J); subapical crest of gonostylus strongly developed . . . . . Jubifer group

MELANOCONION SECTION

13(1). Gonocoxite small, narrow, oblong (Fig. 13 C); gonostylus evenly narrowed and simple, subapical crest absent (Fig. 17 D) . . . . . Atratus group

Gonocoxite conical, obovoid or globose (Fig. 13 A, E, F); gonostylus variously modified, subapical crest usually present 14

14(13). Gonostylus distally divided into 3 long, slender curved arms (Fig. 17 F); lobe of IX tergum elongate, polelike, (Fig. 21 C) . . . . . Trifidus group

Gonostylus not modified as above; lobe of IX tergum variously modified, but not as above 15

15(14). Gonocoxite greatly enlarged, globose (Fig. 13 E); gonostylus large, with strong subapical crest of spines and wavy hairlike tuft on outer submedian prominence (Fig. 17 H) . . . . . Peccator group

Gonocoxite not modified as above; gonostylus variously modified, but not as above 16

16(15). Distal part of lateral plate in lateral apsect with an elongate apical tergal process and a hooked apical sternal process (Fig. 11 D-I) 17

Distal part of lateral plate with a short apical tergal process, a slender or stout spinelike or quadrate median process and/or apical sternal process (Fig. 12 A-I) 22

17(16). Apical tergal process bifurcate at tip (Fig. 11 D, E, G-I) 18

Apical tergal process tapered into a single point (Fig. 11 F) . . . . . Saramaccensis group

18(17). Apical tergal process long and narrow, projecting caudad; apical sternal process basal in position (Fig. 11 D, E) . . Distinguendus group 19

Apical tergal process moderately to very broad; apical sternal process more or less at same level as apical tergal process (Fig. 11 G-I) 20

19(18). Upper point of bifurcate apical tergal process blunt or rounded (Fig. 11 D) . . . . . Putumayensis subgroup

Upper point of bifurcate apical tergal process abruptly pointed . . (Fig. 11 E) . . . . . Distinguendus subgroup; Chrysonotum subgroup; Rorotaensis subgroup; Galindoi subgroup

20(18). Upper point of bifurcate apical tergal process blunt, with a series of teeth; apical sternal process long, with apex projecting basad (Fig. 11 I) . . . . . Educator group

Upper point of bifurcate apical tergal process ending in a point or without teeth; apical sternal process short, with apex projecting caudad (Fig. 11 G, H) . . Erraticus group (in part) . . 21

21(20). Columnar stem of proximal division distally divided into 2 divergent secondary stalks (Fig. 16 G) . . . . . Erraticus subgroup
Columnar stem of proximal division not divided (Fig. 15 D) . . . . . Psatharus subgroup

22(16). Apical median process of lateral plate conical, spinelike or with apex produced into a point tergad (Fig. 12 A-C) . . Intrincatus group (in part) 23

Apical median process of lateral plate broad quadrate or rectangular with flat or truncate apical margin or with tergal and sternal angles produced into strong spines (Fig. D-J) 29

23(22). Lobe of IX tergum forceplike (Fig. 22 E); gonostylus very thick and evenly broad, subapical crest of spicules not distinct (Fig. 18 H) . . . . . Penai subgroup

Lobe of IX tergum and gonostylus not modified as above 24

24(23). Lobe of IX tergum slender, very long, and tubular (Fig. 22 D) . . . . Tecmarsis subgroup

Lobe of IX tergum not modified as above 25

25(24). Columnar stem of proximal division distally divided into 2 secondary stalks (Fig. 16 B, D) 26

Columnar stem of proximal division not distally divided (Fig. 16 A, C) 28

26(25). Distal division with distinct leaf at base or apex; columnar stem of proximal division with secondary stalks clearly separated from one another (Fig. 16 B) 27

Distal division without leaf; columnar stem of proximal division with secondary stalks largely overlapped at bases (Fig. 16 D) . . . . Andricus subgroup

27(26). Basal stem of distal division long, columnar, with all setae situated on extreme apex . . . . . Eastor subgroup

Basal stem of distal division short, with setae situated from median to apical portion (Fig. 16 B) . . . . . Intricatus subgroup

28(25). Leaf of distal division broad, oval; columnar stem of distal division slender and long (Fig. 16 A) . . Erraticus group (in part) . . . Clarki subgroup

Leaf of distal division narrow, with characteristic hooked apex; columnar stem of proximal division thicker and shorter (Fig. 16 C) . . Intrincatus group (in part) . . . . . Idottus subgroup

29(22). Apical sternal process absent (Fig. 12 E-G) . . . . Conspirator group

Apical sternal process present (Fig. 12 D, E, H, I) 30

30(29). Apical sternal process of lateral plate basal in position (Fig. 12 H, I), apex of gonostylus swollen or forming prominent head (Figs. 17 L, 18 L) . . Pilosus group 31

Apical sternal process of lateral plate submedian or subapical in position or at same level as apical tergal process (Fig. 12 D, E), apex of gonostylus not forming prominent head 32

31(30). Lobe of IX tergum small, fingerlike (Fig. 22 F) . . Pilosus subgroup

Lobe of IX tergum very large, sac-like (Fig. 22 H) . . . . . Caudelli subgroup

32(30). Apical sternal process well developed; apical median process prominent, and usually with row of distinct teeth on apical margin (Fig. 12 E) . . Inhibitator Group 33

Apical sternal process poorly developed; apical median process not well developed, its apical margin smooth, irregular or with few teeth confined to tergal angle (Fig. 12 D) 35

33(32). Gonostylus enlarged and strongly modified (Fig. 17 J, 18 J) . . . 34

Gonostylus not modified as above or normal . . . Inhibitator subgroup

34(33). Lobe of IX tergum enlarged, sac-like (Fig. 22 G); gonostylus as illustrated in Fig. 17 J . . . . . Egcymon subgroup

Lobe of IX tergum not modified as above; gonostylus as illustrated in Fig. 18 J . . . . . Mulrennani subgroup

35(32). Tergal angle of apical median process with at least 2 distinct denticles . . Bastagarius group (in part) . . Iolambdis subgroup

Tergal angle of apical median process ending in a point 36

36(35). Columnar stem of proximal division distally divided into 2 divergent stalks; apical median process of lateral plate relatively small, apical margin irregular . . . . . Evansae group

Columnar stem of proximal division not clearly divided into 2 stalks as above (Fig. 16 E, F); apical median process of lateral plate larger, apical margin smooth . . Bastagarius group (in part) . . . . . Bastagarius subgroup

PUPAE

1. Trumpet very slender and long, at least 1.0 mm; meatus without narrow slit or cleft extending from ventral margin of pinna; seta 5-C remarkably strong, its length about as long as trumpet; seta 9-VIII strong, as long as paddle length . . . . OCELLATUS SECTION

Trumpet short to moderately long, 0.3-0.8 mm; meatus with distinct slit or cleft extending from pinna; setae 5-C and 9-VIII not as strong as above 2

2(1). Seta 9-VIII placed at or close to caudolateral angle of segment; seta 11-C usually double . . SPISSIPES SECTION 3

Seta 9-VIII placed distinctly cephalad of caudolateral angle of segment; seta 11-C usually single . . MELANOCONION SECTION . . 9

SPISSIPES SECTION

3(2). Seta 5-IV double, 1.5 times as long as segment V; pinna of trumpet narrow, its length, including slit about 0.3 total length of trumpet . . . . . Jubifer group

Seta 5-IV 3-8 branched, shorter to slightly longer than segment V; pinna, including slit about 0.5 total length of trumpet . . . 4

4(3). Setae 3-I,II and 9-VII, VIII usually double 5

Setae 3-I,II and 9-VII, VIII usually single 8

5(4). Seta 10-C 3-5 branched 6

Seta 10-C 8-15 branched . . Taeniopus group (in part) 7

6(5). Meatus of trumpet thick and moderately or strongly swollen in middle; seta 6-III-VI usually single . . . . . Spissipes group

Meatus of trumpet slender and uniformly cylindrical; setae 6-III-VI double or triple . . Taeniopus group (in part) . . . . . Taeniopus subgroup

7(5). Seta 4-I strong, subequal to 3-I; 6-III-VI usually triple . . . . . Vomerifer subgroup

Seta 4-I minute, much shorter than 3-I; 6-III-VI usually single or double . . . . . Pedroi subgroup

8(4). Caudolateral angle of segment VIII strongly produced into sharp point; pinna of trumpet moderately to strongly flared . . . . . Ocossa group

Caudolateral angle of segment VIII not produced as above; pinna of trumpet not flared or same diameter as meatus . Paracrybda group

MELANOCONION SECTION

9(2). Trumpet thin and long, index 10 or greater 10

Trumpet rather thick, short to moderately long, index usually 5-8, sometimes lower 12

10(9). Seta 6-III-VI usually 5,6 branched . . . . . Atratus group

Seta 6-III-VI usually double or triple . . Distinguendus group (in part) 11

11(10). Seta 9-VIII 4 branched; 5-IV 4-6 branched . . . Putumayensis subgroup

Seta 9-VIII 5,6 branched; 5-IV double or triple . . . . . Distinguendus subgroup

12(9). Seta 9-VII double or triple . . . . . Trifidus group

Seta 9-VII at least 4 branched 13

13(12). Meatus of trumpet thick, uniform in width or swollen in apical 0.5 14

Meatus of trumpet slender to moderately thick, usually uniform in width but not swollen in apical 0.5 17

14(13). Meatus of trumpet distinctly swollen in apical 0.5, apical margin more or less rounded 15

Meatus of trumpet not swollen in apical 0.5, apical margin truncate 16

15(14). Trumpet 0.45-0.5 mm long; seta 5-IV 5,6 branched . . Distinguendus group (in part) . . . . . Rorotaensis subgroup

Trumpet 0.25-0.35 mm long; seta 5-IV 4 branched . Saramaccensis group

16(14). Seta 8-C 3,4 branched; 6-III-VI usually double . . Distinguendus group (in part) . . . . . Chrysonotum subgroup

Seta 8-C 5-8 branched; 6-III-VI usually 3,4 branched . . Erraticus group (in part) . . . . . Erraticus subgroup

17(13). Seta 6-III-VI usually 5,6 branched . . . . . Educator group

Seta 6-III-VI usually 1-3 branched 18

18(17). Seta 6-III-VI usually single . . Erraticus group (in part) . . . . . Psatharus subgroup

Seta 6-III-VI usually double or triple 19

19(18). Seta 3-II,III usually double . . . . . Intrincatus group; Bastagarius group

Seta 3-II,III usually single 20

20(19). Trumpet relatively short, usually 0.35 mm in length; paddle seta 2-P very distinct, 3,4 times as long as 1-P . . . . . Pilosus group

Trumpet relatively long, 0.4-0.5 mm in length; paddle seta 2-P rather indistinct or distinct, at most 2 times as long as 1-P 21

21(20). Seta 1-C usually triple; 5-V usually triple . . . . Conspirator group

Seta 1-C usuallly 4,5 branched; 5-V 4-6 branched . Inhibitator group; Evansae group

LARVAE

1. Thorax and abdomen with several strong stellate setae; caudolateral margin of saddle with long spinelike spicules . . . . . OCELLATUS SECTION

Thorax and abdomen without strong, stellate setae as above; caudolateral margin of saddle with short, minute spicules 2

2(1). Seta 8-P 4-6 branched; 7-P usually 4,5 branched . . SPISSIPES SECTION 3

Seta 8-P usually double or single; 7-P usually triple or double . . 8

SPISSIPES SECTION

3(2). Abdominal seta 7-I double; comb scales numerous, all with apical fringe of evenly fine spicules 4

Abdominal seta 7-I single; comb scales rather few in number, some strongly differentiated into large acute spines 7

4(3). Setae 2,3-A of antenna subapical; seta 1-M single, strong, as long as 5-M; median caudal filament of spiracular apparatus of siphon remarkably long . . . . . Spissipes group

Setae 2,3-A of antenna apical; seta 1-M 1-3 branched, small, considerably shorter than 5-M; median caudal filament of spiracular apparatus of siphon not as long as above . . Taeniopus group 5

5(4). Seta 5-C 4,5 branched; seta 6-I,II double . . . . Taeniopus subgroup

Seta 5-C 7-9 branched; seta 6-I,II triple 6

6(5). Siphon with prominent rows of strong subventral tufts, their length 3-4 times as long as siphon width at point of insertion; pecten teeth without distinct basal denticle . . . . Vomerifer subgroup

Siphon without promenent row of subventral tufts as above, all tufts rather weak, relatively short and widely spaced, 1-2 times as long as siphon width at point of insertion; pecten teeth with strong basal denticle . . . . . Pedroi subgroup

7(3). Seta 7-P triple; siphon with 7 pairs of subventral tufts . . . . . Paracrybda group

Seta 7-P 4,5 branched; siphon with 4,5 pairs of subventral tufts . . . . . Ocossa group

8(2). Seta 2-C present, 14-C distinctly cephalad of 15-C; saddle without distinct spicules on caudolateral border . . . . . Jubifer group

Seta 2-C absent, 14-C at same level as or slightly cephalad of 15-C; saddle with distinct spicules on caudolateral border . . MELANOCONION SECTION 9

MELANOCONION SECTION

9(8). Siphon rather thick and short, 0.45-0.60 mm in length; subventral tufts 7,8 pairs, all remarkably long, forming brushlike row from inside pecten to near extreme apex of sipon 29

Siphon slender, moderately to very long, usually 1.0 mm or at least 0.70 mm in length; subventral tufts 4-6 pairs, weakly or strongly developed, but not as above, forming weak or prominent row usually from beyond pecten to about 0.75 of siphon length from base 10

10(9). Siphon with 3,4 pairs of small dorsolateral setae inserted between 0.3 and 0.75 of its length from base . . . . . Atratus group

Siphon with 2 pairs of small dorsolateral setae inserted between 0.5 and 0.75 of its length from base 11

11(10). Siphon slender and relatively long, 1.5-2.0 mm; subventral tufts weakly to moderately developed, widely spaced, not forming a dense row . . Distinguendus group (in part) 12

Siphon thicker and shorter than above, usually 0.90-1.2 mm in length; subventral tufts stronger, closely spaced or forming a prominent row 13

12(11). Seta 7-I double; subventral tufts of siphon 3,4 times as long as siphon width at point of insertion . . . . Putumayensis subgroup

Seta 7-I single; subventral tufts of siphon shorter or rather inconspicuous, about as long as siphon width at point of insertion . . . . . Distinguendus subgroup

13(11). Seta 8-P single; 7-P usually double; 4 or 5 distal pecten teeth strongly enlarged and closely packed . . . . . Trifidus group

Seta 8-P usually double; 7-P usually three or more branched; distal pecten teeth not strongly enlarged or closely packed as above 14

14(13). Comb scales 7-27, their apices terminating in a sharp spine . . . 15

Comb scales 30-50, their apices rounded or truncate and fringed with evenly fine spicules 20

15(14). Siphon strongly tapered and curved dorsad in distal portion; hooked seta 2-S of siphon enlarged and prominent . . Distinguendus group (in part) . . . . . Rorotaensis subgroup

Siphon gradually tapered and straight in distal portion; hooked seta 2-S of siphon weakly to moderately developed 16

16(15). Ventral brush (seta 4-X) of saddle composed of 5 pairs of setae . 17

Ventral brush of saddle composed of 6 pairs of setae 18

17(16). Seta 4-P double; siphon 0.85 mm; subventral tufts 3-4 times as long as siphon width at points of insertion . . . Saramaccensis group

Seta 4-P single: siphon longer, at least 1.0 mm; subventral tufts shorter, about 2 times as long as siphon width at points of insertion . . . . . Evansae group

18(16). Seta 4-P single; integument of thorax and abdomen covered with very conspicuous spicules 19

Seta 4-P double; integument of thorax and abdomen not covered with distinct spicules as above . . . . . Educator group

19(18). Seta 5-C single or double; 3-P usually double and long, about 0.5 length of setae 1,2-P . . Distinguendus group (in part) . . . . . Chrysonotum subgroup

Seta 5-C 4,5 branched; 3-P 7-10 branched and short, about 0.3 length of setae 1,2-P . . Erraticus group (in part) . . . . . Erraticus subgroup

20(14). Seta 1-C (preclypeal spine) short, flattened and apically blunt; pecten teeth short, broad, conical, with apices not projecting beyond ventral margin of siphon . . Erraticus group (in part) . . . . . Psatharus subgroup

Seta 1-C long, spiniform, or sharply pointed apically; pecten teeth long, narrow, spinelike, with apices projecting beyond ventral margin of siphon 21

21(20). Seta 4-P usually double; 1-M reduced, rather inconspicuous, its length at most 0.50 of 3-M . . Intrincatus group (in part) . 22

Seta 4-P usually single; 1-M well developed and very distinct, its length subequal to or longer than 3-M 25

22(21). Setae 2,3-A of antenna apical . . . . . Idottus subgroup

Setae 2,3-A subapical 23

23(22). Seta 4-P widely separated, its length about 0.3 distance between bases of the pair; spiculation of thorax and abdomen distinct 24

Seta 4-P close together, its length about as long as distance between bases of the pair; spiculation of thorax and abdomen indistinct . . . . . Eastor subgroup

24(23). Seta 5-C usually single; 12-C distinct, 4,5 branched; siphon with median dark ring . . . . . Tecmarsis subgroup

Seta 5-C usually double; 12-C indistinct, 2-4 branched; siphon without median dark ring . . . . . Intrincatus subgroup

25(21). Seta 7-P usually double; 3-P usually double or triple (1-5b) . . . . . Conspirator group

Seta 7-P usually triple; 3-P usually 4-6 branched 26

26(25). Seta 4-C close together near dorsal midline; 12-C double or triple . . Bastagarius group (in part) 27

Seta 4-C widely separated; 12-C at least 4 branched (4-6b) 28

27(26). Seta 5-C 3-6 branched . . . . . Bastagarius subgroup

Seta 5-C single or double . . . . . Iolambdis subgroup

28(26). Seta 2-VIII double; siphon/saddle ratio usually more than 3 . . . . . Inhibitator group

Seta 2-VIII single; siphon/saddle ratio usually less than 3 . . . . . Peccator group

29(9). Seta 7-C 10-12 branched; 12-C double . . Intrincatus group (in part) . . . . . Andricus subgroup

Seta 7-C 4-7 branched; 12-C 5,6 branched . . Pilosus group 30

30(29). Seta 4-C double, minute or rather indistinct . . . . Pilosus subgroup

Seta 4-C multiple, large and very distinct . . . . Caudelli subgroup

OCELLATUS SECTION

FEMALE. As described for the subgenus with the following characteristics: *Head*. Decumbent scales in center of vertex narrow, numerous, occupying an extensive area from coronal suture to near sides of eyes; lateral patch of broad appressed scales small; erect scales usually entirely white, sometimes brown. *Thorax*. Scutum with a pair of dark eyelike spots on antealar and supraalar areas. Pleuron with a broad vertical scale patch extending from

upper corner to lower posterior border of mesokatepisternum. *Legs*. Without any distinctive ornamentation. *Wing*. Plume scales on all veins long, narrow, linear or clavate. *Abdomen*. Terga II-VII without basolateral pale spots or basal transverse pale bands.

FEMALE CIBARIAL ARMATURE (Fig. 8 A). Cibarial teeth about 40, all very narrow and distally filamentous; hollow area on central axis of teeth absent.

MALE. In general as in female. *Head*. Palpus varying from 0.75 to as long as proboscis; palpomeres 4,5 non-plumose or with only a few short setae. Flagellar whorls of antenna strongly plumose.

MALE GENITALIA. *Segment IX* (Fig. 20 A). Tergal lobe small, mound-shaped, bearing 6-12 weak setae; interlobar space wide. *Gonocoxite* (Fig. 13 A). Slender, conical-comma shaped, sometimes broad oval or swollen at middle. *Subapical Lobe* (Fig. 14 A). Columnar stems of proximal and distal divisions well developed, widely separated and not distally divided. *Gonostylus* (Fig. 17 A). Shape normal or without special modification, subapical crest of spicules absent or poorly developed. *Phallosome* (Fig. 10 A). Aedeagus in tergal aspect with a distinct tergal bridge connecting the 2 lateral plates; basal hook of lateral plate broadly sclerotized, relatively short with sternal margin tapered into a blunt point; distal part simple, with a narrow caudal process only. *Proctiger* (Fig. 19 F). Apical crown small, with 4,5 teeth.

PUPA. *Cephalothorax*. Seta 5-C remarkably strong and long, subequal to trumpet length. *Trumpet*. Very long, slender, about 1.0 mm; pinna small, meatal slit absent. *Metanotum*. Seta 11-C single. *Abdomen*. Seta 5-IV-VI double or triple, remarkably long, at least 2 times as long as following segment; 6-III-VI long, single; 9-VIII double, remarkably strong, as long as paddle, inserted at or close to caudolateral angle of segment VIII. *Paddle*. Broad, hemispherical and largely pale; setae 1,2-P minute, inconspicuous.

LARVA. *Head*. Ocular bulge not prominent; seta 2-C absent; mental plate with 8,9 lateral teeth on each side of median tooth. Antenna relatively short and thin, less than 0.5 head length; seta 1-A short, weakly developed. *Thorax*. Spiculation absent; setae 7,8-P single; 0-P, 1-M, T and 13-T strong, stellate. *Abdomen*. Seta 6-I,II triple; 7-I double; 1-I-VI, 3-I-VI and 13-I-VI strong, stellate. Comb scales numerous, 30-40, all narrow, with apical fringe normal or barbed with evenly fine spicules. Setae 1,2-VIII without basal sclerotized plate. *Siphon*. Slender, distally tapering; moderately to very long, 1.25-2.0 mm; pecten teeth about 8, widely spaced, all without distinct barb of fine denticles; subventral tufts 5 pairs, each double, all strong, 4,5 times as long as siphon width at points of insertion; dorsolateral setae 2 pairs, inserted between 0.5-0.75 of siphon length from base; 2-S strong, simple and hooked. *Anal Segment*. Caudalolateral margin of saddle strongly spiculate or with numerous, long spinelike spicules; ventral brush (4-X) with 5 pairs of setae.

DISCUSSION. The Ocellatus section of 4 closely related species (*ocellatus, nigrimacula, punctiscapularis* and *flochi*) is the most distinctive of the 3 sections of *Melanoconion* and might even be recognized as a separated subgenus. This section corresponds to the *ocellatus* group of Duret (1969:113-134), characterized in the adults by the presence of a pair of dark, eyelike

spots on the antealar and supraalar areas of the scutum and by other distinctive features as indicated in the keys. It exhibits a rather bizarre combination of characters with the male genitalia typical of *Melanoconion*, the dark spots of the scutum of the adults like *Cx. stonei* Lane & Whitman 1943 and *shopei* Forattini & Toda 1966 of *Microculex* and the pupa and larva of *Micraedes* (Berlin 1969). Since members of the Ocellatus section and the latter 2 subgenera breed in leaf bases of epiphytic bromeliads, it is possible that their similarity is due to convergence. Further study on the relationships among these distinct lines would significantly contribute to a more natural classification of the groups.

The distribution pattern of the members of the Ocellatus section appears to be localized and widely disjunct over a large biogeographic area. The reported range extends from Colombia eastward through northern South America and southward as far as Sao Paulo, Brazil. Adult biology and medical importance are unknown.

SPISSIPES SECTION

FEMALE. As described for the subgenus with the following characteristics. *Head*. Decumbent scales in center of vertex largely narrow, numerous, usually occupying an extensive area, sometimes restricted to a small triangular patch along coronal suture; lateral patch of broad appressed scales usually small, sometimes large, extending dorsad to posterolateral area; erect scales usually entirely dark, rarely partially pale golden. *Thorax*. Scutal integument dark brown to nearly black; scales usually entirely dark, sometimes partially pale golden on anterior half of scutum or partially whitish on prescutellar space and scutellar lobes. Pleuron usually without scale patch except on lower posterior surface of mesokatepisternum, latter sometimes with a small scale patch on its upper corner. *Legs*. Usually without distinctive ornamentation, sometimes with distinct white rings at joints of hindtarsomeres 1-5 and/or whitish knee spots on apices of femora. *Wing*. Plume scales on all veins short, broad ovate or squamous. *Abdomen*. Terga II-VII usually with distinct basolateral pale spots; basal transverse pale bands usually absent, rarely present.

FEMALE CIBARIAL ARMATURE (Fig. 8 B-F). Cibarial teeth varied, usually large, columnar, 10-17, with hollow area largely restricted to basal portion, sometimes small, toothlike, numerous, 20-40, all entirely pigmented.

MALE. In general as in female. *Head*. Palpus usually exceeding proboscis by at least 0.5 of palpomere 5, rarely shortened or subequal to proboscis; palpomeres 4,5 moderately to strongly plumose. Flagellar whorls of antenna strongly plumose.

MALE GENITALIA. *Segment IX* (Fig. 20 D-J). Tergal lobe variously developed. *Gonocoxite*. Usually conical-comma shaped, sometimes swollen at middle, ovoid or slightly modified. *Subapical Lobe* (Fig. 14 E-H). Columnar stems of proximal and distal divisions well developed, that of proximal not distally divided. *Gonostylus* (Fig. 17 B, G, I, K, 18 A, C). Usually normal or unmodified, sometimes angulate or swollen distad of median curvature; subapical crest poorly or strongly developed. *Phallosome* (Fig. 10 D-I). Aedeagus without upper tergal bridge; basal hook of lateral plate broadly sclerotized and with rounded sternal margin, distal part usually produced tergad and

sternad, with an elongate beaklike apical tergal process and a short, hooked sternal process or spine, sometime simple or represented by a single caudal process only. *Proctiger*. Apical crown small, with a comblike row of 7-12 teeth.

PUPA. *Cephalothorax*. Seta 5-C reduced or not strongly developed. *Trumpet*. Usually long, uniformly cylindrical or sometimes swollen in middle, length varying from 0.65-0.7 mm, sometimes shorter, funnel-shaped; pinna broad with meatal slit extending to 0.3-0.5 of total length of meatus. *Metanotum*. Seta 11-C usually double, rarely single. *Abdomen*. Seta 5-IV-VI two or more branched, shorter to slightly longer than following segment; 6-III-VI moderately developed, usually single or double, sometimes 3,4 branched; 9-VIII 1-4 branched, short, inserted at caudolateral angle of segment. *Paddle*. Broad, hemispherical, entirely pale or partially pigmented; setae 1,2-P distinct.

LARVA. *Head*. Ocular bulge prominent; seta 2-C present or absent; mental plate with 5-7 lateral teeth on each side of median tooth. Antenna long, stout, subequal to head length; seta 1-A long, strongly plumose. *Thorax*. Spiculation present or absent; setae 7,8-P usually 4-6 branched, sometimes 7-P triple or double and 8-P single; 0-P, 1-M,T and 13-T normal, not stellate. *Abdomen*. Seta 6-I,II usually triple, sometimes double; 7-I usually double, sometimes single; 1,3 and 13-I-VI normal not stellate. Comb scales usually numerous, 30-40 or more, with even fringe of fine spicules or sometimes posterior scales strongly differentiated into large, elongate spines. *Siphon*. Usually slender, relatively long, sometimes thicker and short, 0.8-1.7 mm; pecten teeth 5-10, with fine barb of delicate denticles; subventral tufts weakly to strongly developed, usually 5 pairs, sometimes 3, 6 or 7, their length varying from 1 to 4 times as long as siphon width at points of insertion; dorsolateral setae usually 2 pairs, sometimes 3, inserted between 0.5-0.75 of siphon; 2-S strong or moderately developed, usually with submedian accessory spine, sometimes simple. *Anal Segment*. Caudolateral margin of saddle usually lightly spiculated, sometimes practically bare; ventral brush (4-X) with 6 pairs of setae.

DISCUSSION. The Spissipes section recognized here includes most of the species previously assigned by Galindo (1969) to his *Culex spissipes* group on the basis of the male genitalia and larval characters. In this study, the group is broadly interpreted and treated as a section to also include other species which exhibit the following shared characters: (1) in the male genitalia, the broadly sclerotized basal hook of the lateral plate; (2) in the general adult features, the largely narrow decumbent scales in the center of the vertex; (3) in the pupa, the insertion of seta 9-VIII at caudolateral angle of segment VIII; and (4) in the larva, the usually 4-6 branched setae 7,8-P and double seta 7-I and/or the presence of seta 2-C. Of all stages, the shape of the basal hook of the male genitalia and the pupal character noted above are the most characteristic and, I believe, are also of great importance in indicating the relationships among the species placed in this section. As outlined in the proposed scheme, the 19 species of the *Spissipes* section apparently fall into 8 natural groups: Spissipes, Taeniopus, Paracrybda, Ocossa, Jubifer, Faurani, Nicaroensis and Lopesi. These groups can be readily separated by the characteristic male genitalia and certain features of the adults, pupa and larva, as indicated in the keys. The immatures of the Faurani, Nicaroensis and Lopesi groups are not yet known, thus these groups are provisionally assigned to this section primarily on the basis of the male

genitalia and adult characters.

Of the 3 sections of *Melanoconion*, the Spissipes section is apparently the most generalized and primitive, exhibiting the type of lateral plate of the male genitalia similar to that of the subgenera *Anoedioporpa* and *Tinolestes*. Certain groups of this section, particularly the Spissipes and Taeniopus groups also exhibit female cibarial teeth similar to those of *Tinolestes*, *Belkinomyia* and *Galindomyia* (Sirivanakarn 1978). This evidence suggests that these groups probably share a common ancestor with *Anoedioporpa*, *Tinolestes*, *Belkinomyia* and *Galindomyia*.

The Spissipes section is the most important of all sections of *Melanoconion* in the natural transmission of arboviruses. As indicated in the section of medical importance, at least 8 species (*taeniopus*, *ocossa*, *panocossa*, *pedroi*, *vomerifer*, *portesi*, *delpontei* and *crybda*) are currently known to be natural or potential vectors of Venezuelan Equine Encephalomyelitis and various other strains of arboviruses.

The distribution of the Spissipes section covers the entire reported range of the subgenus. Its center of distribution appears to be in Central America where the majority of the species occur, particularly in jungle swamps or open marshy areas along the Atlantic coast.

MELANOCONION SECTION

FEMALE. In general as described for the subgenus with the following characteristics. *Head*. Decumbent scales in center of vertex usually entirely broad and appressed, sometimes narrow, forming a relatively small triangular patch along coronal suture; lateral patch of broad appressed scales large or very conspicuous; erect scales entirely dark. *Thorax*. Scutal integument usually dark brown, sometimes pale reddish, yellowish or with orange tinge; all scales usually entirely dark or same color as underlying integument. Pleuron usually without scale patch on upper corner of mesokatepisternum and upper median surface of mesanepimeron, sometimes scale patches present. *Legs*. Usually without any distinctive ornamentation. *Wing*. Plume scales on all veins usually short, broad ovate or squamous. *Abdomen*. Terga II-VII with distinct basolateral pale spots or sometimes with complete basal transverse pale bands.

FEMALE CIBARIAL ARMATURE (Fig. 8 G-L, Fig. 9 A-I). Cibarial teeth usually large, hollow columnar, 3-8 in number, sometimes more numerous, narrow, with or without hollow area at bases or on axis.

MALE. In general as in female. *Head*. Palpus usually exceeding proboscis by at least 0.5 of palpomere 5, rarely as long as or subequal to proboscis; palpomeres 4,5 weakly to strongly plumose, rarely non-plumose. Flagellar whorls of antenna strongly plumose.

MALE GENITALIA. *Segment IX* (Figs. 21, 22). Tergal lobe variously modified. *Gonocoxite* (Fig. 13 C, E, F). Small to large, conical, oblong or globose. *Subapical Lobe* (Figs. 15, 16). Columnar stems of proximal and distal divisions usually well developed, that of proximal usually divided into 2 divergent stalks, sometimes undivided; specialized setae and leaves on each division variously developed. *Gonostylus* (Figs. 17 D, F, H, J, L-N; 18 B, D-

L). Variously modified from simple, sickle shape to being strongly swollen, forming a prominent head beyond median curvature, distal portion undivided (except *trifidus*). *Phallosome* (Figs. 11, 12). Aedeagus without upper tergal bridge (except *penai*); basal hook of lateral plate narrowly sclerotized, or in form of a slender curved rod, its distal part simple or variously modified with bifurcate tipped apical tergal process, apical sternal spinelike process and/or median, pointed or truncate process. *Proctiger*. Apical crown comblike, with 7-12 teeth, rarely more numerous.

PUPA. *Cephalothorax*. Seta 5-C not strongly developed. *Trumpet*. Moderately long, 0.35-0.60 mm, more or less uniformly cylindrical; pinna broad with meatal slit extending to about 0.3 of total length of meatus. *Metanotum*. Seta 11-C single. *Abdomen*. Seta 5-IV-VI with 3 or more branches, usually shorter than following segment; 6-III-VI usually at least three or more branched, sometimes double; 9-VIII 3-7 branched, always removed cephalad of caudolateral angle of segment. *Paddle*. Broad, hemispherical and usually entirely pale or transparent; setae 1,2-P moderately to well developed and distinct.

LARVA. *Head*. Ocular bulge always prominent; seta 2-C absent; mental plate with 5,6 lateral teeth on each side of median tooth. Antenna long, stout, subequal to head length; seta 1-A strongly plumose. *Thorax*. Spiculation moderately to strongly developed; seta 7-P usually triple or sometimes double; seta 8-P usually double or sometimes single; 0-P, 1-M,T and 13-T weakly to strongly developed but not stellate. *Abdomen*. Seta 6-I,II usually double, sometimes triple; 7-I usually single, rarely double; 1,3,13- I-VI normally developed, not stellate. Comb scales usually numerous, 20-50 with normal fringe of fine spicules or with distinct apical median spine, sometimes 7-12, all large, spinelike, in a single row. *Siphon*. Length varying from 0.65-2.2 mm, usually about 1.0 mm; pecten teeth 7-16 or more, all usually narrow and increased in length toward proximal portion of siphon; subventral tufts usually well developed, 4-8 pairs, forming a prominent row usually from beyond pecten to about 0.75 of siphon length, sometimes extending to near apex, their length varying from 1-6 times as long as siphon width at points of insertion; dorsolateral setae usually 2 pairs, sometimes 3 or 4; seta 2-S moderately to strongly developed. *Anal Segment*. Caudolateral margin of saddle lightly to moderately spiculated; ventral brush (4-X) with 5,6 pairs of setae.

DISCUSSION. The Melanoconion section recognized here is the largest and most complex of all 3 sections of *Melanoconion*. Included within this section are some 125 species most of which were previously segregated into sections *Dinoporpa, Choeroporpa, Mochlostyrax, Melanoconion* and *Gnophodeomyia* by Dyar (1928) and Rozeboom and Komp (1950). In this study, all of these sections are combined into the single Melanoconion section on the basis of the following shared characters: (1) in the male genitalia, the narrowly sclerotized basal hook of the lateral plate; (2) in the general adult features, the usually broad appressed decumbent scales of the vertex (except Atratus and Distinguendus groups); (3) in the pupa, the position of seta 9-VIII which is removed cephalad of caudolateral angle of the segment and the usually single seta 11-C of metanotum; and (4) in the larva, the usually double seta 6-I,II, single seta 7-I, triple or double seta 7-P and double seta 8-P.

The members of the Melanoconion section are strongly differentiated from

one another by the modification of the various components of the male genitalia, but less so or not at all in the external features of the adults, female cibarial armature and the immature stages. Most of the species in this section are known only from males and the taxonomic status of several nominal forms remains uncertain. Based primarily on the male genitalia and to a certain extent also on other stages of several known species, 13 groups are recognized. These are: Atratus, Distinguendus, Trifidus, Saramaccensis, Erraticus, Educator, Intrincatus, Bastagarius, Evansae, Inhibitator, Conspirator, Pilosus and Peccator. As outlined in the proposed scheme, six of these groups (Distinguendus, Erraticus, Intrincatus, Bastagarius, Inhibitator and Pilosus) are further subdivided into subgroups. The relationships between or among these groups are very difficult to interpret because of the extreme diversity or overlap in one or more stages. However, from the detailed comparative study of each component of the male genitalia and the analysis of the distribution of similar genitalic characters among the various groups, some indications of the probable relationships are evident. Possibly of great importance are the trends in the modification of the distal part of the lateral plate of the aedeagus. Based on this character, there appear to be 3 distinct lines, with the Atratus, Distinguendus and Intrincatus groups that represent the ancient stocks from which the other groups were probably derived. The three lines are composed of the following groups: (1) Atratus and Trifidus (2) Distinguendus, Saramaccensis, Erraticus, Educator and perhaps also Peccator; and (3) Intrincatus, Bastagarius, Evansae, Inhibitator, Conspirator and Pilosus. The relationship between the Atratus and Trifidus groups is evident in the type of lateral plate as shown in Fig. 11 A and B; that of the Distinguendus and 4 other groups is evident as shown in Fig. 11, D-I; and that of Intrincatus and 5 other groups is evident as shown in Fig. 12 B-I. The modification of the lateral plate in the Intrincatus line largely involves the development of the apical median process which is absent in the Atratus and Distinguendus lines. This process is probably developed from the upper point of the bifurcate tipped apical tergal process of the Distinguendus and Erraticus types. Other modification of the lateral plate in the Intrincatus line also involves the reduction or expansion of the apical median process, and loss or shifting in position of the apical sternal hooked process as shown in the Bastagarius, Inhibitator, Conspirator and Pilosus groups.

The Melanoconion section is the most widespread and has been reported from all areas within the range of the subgenus. As in the Spissipes section, its center of distribution appears to be in Central America and adjacent areas in northern South America where all of the groups and most of the subgroups are represented. As far as known, all species in this section are typical groundpool forms. Adults of various species are relatively common and have been captured in practically all types of collections. The adult biology and medical importance are largely unknown. Currently, only 3 species, *iolambdis*, *elevator* and *dunni*, have been reported to harbor certain strains of arboviruses (Galindo 1978).

LITERATURE CITED

Adames, A. J.

1971. Mosquito Studies (Diptera, Culicidae). XXIV. A revision of the crabhole mosquitoes of the genus *Deinocerites*. Contrib. Am. Entomol. Inst. (Ann Arbor) 7(2):1-154.

Adames, A. J. and P. Galindo
1973. Mosquito Studies (Diptera, Culicidae). XXX. A new subgenus and species of *Culex* from Colombia. Contrib. Am. Entomol. Inst. (Ann Arbor) 9(3):55-61.

Aiken, J.
1909. Notes on the mosquitoes of British Guiana. Brit. Guiana Med. Ann. 1908:1-25.

1911. A synoptical view of the mosquitoes of British Guiana. Timeri. 1:187-204.

Aitken, T. H. G. and P. Galindo
1966. On the identity of *Culex (Melanoconion) portesi* Senevet and Abonnenc, 1941 (Diptera, Culicidae). Proc. Entomol. Soc. Wash. 68:198-208.

Aitken, T. H. G., C. B. Worth, A. H. Jonkers, E. S. Tikasingh and W. G. Downs
1968. Arbovirus studies in Bush Bush forest, Trinidad, W. I., September 1959-December 1964. III. Entomologic Studies. Am. J. Trop. Med. Hyg. 17:253-258.

Aitken, T. H. G., L. Spence, A. H. Jonkers and W. G. Downs
1969. A 10-year survey of Trinidadian arthropods for natural virus infections (1953-1963). J. Med. Entomol. 6:207-215.

Belkin, J. N.
1962. The mosquitoes of the South Pacific. 2 vol. Berkeley, Univ. Calif. Press. 608 p., 412 Figs.

1968. Mosquito Studies (Diptera, Culicidae). IX. The type specimens of New World mosquitoes in European museums. Contrib. Am. Entomol. Inst. (Ann Arbor). 69 p.

Belkin, J. N. and C. L. Hogue
1959. A review of the crabhole mosquitoes of the genus *Deinocerites* (Diptera, Culicidae). Univ. Calif. Publ. Entomol. 14:411-458.

Belkin, J. N., R. X. Schick, P. Galindo and T. H. G. Aitken
1965. Mosquito studies (Diptera, Culicidae). I. A project for a systematic study of the mosquitoes of Middle America. Contrib. Am. Entomol. Inst. (Ann Arbor) 1(2):1-78.

Belkin, J. N., R. X. Schick and S. J. Heinemann
1971. Mosquito Studies (Diptera, Culicidae). XXV. Mosquitoes originally described from Brazil. Contrib. Am. Entomol. Inst. (Ann Arbor) 7(5):1-64.

Belkin, J. N., S. J. Heinemann and W. A. Page
1970. Mosquito Studies (Diptera, Culicidae). XXI. The Culicidae of Jamaica. Contrib. Am. Entomol. Inst. (Ann Arbor) 6(1):1-458.

Berlin, O. G. W.
1969. Mosquito Studies (Diptera, Culicidae). XVII. The subgenus

Micraedes of *Culex*. Contrib. Am. Entomol. Inst. (Ann Arbor) 5(1):21-63.

Berlin, O. G. W. and J. N. Belkin
1980. Mosquito Studies (Diptera, Culicidae). XXXVI. Subgenera *Aedinus*, *Tinolestes* and *Anoedioporpa* of *Culex*. Contrib. Am. Entomol. Inst. (Ann Arbor) 17(2):1-104.

Casal, O. H.
1963. Comentarios a proposito de la revalidacion de "*Culex (Melanoconion) clarki*" Evans (Diptera: Culicidae). Revta Bras. Biol. 23:317-320.

Clastrier, J.
1968. Presence, en Guyane Francaise, de *Culex (Melanoconion) creole* Anduze, 1948 et *Culex (Mochlostyrax) foliafer* Komp et Rozeboom, 1951 (Diptera, Culicidae). Inst. Pasteur Guyane Fr. et de l'Inini Arch. 21:225-230.

1970a. *Culex (Melanoconion) dolichophyllus* n. sp. et *Culex (Microculex) stonei* Lane et Whitman, 1943 (Diptera, Culicidae) en Guyane Francaise. Annls. Parsitol. hum. comp. 45:857-861.

1970b. Quatre nouveau *Melanoconion* (Diptera, Culicidae) de la Guyane Francaise. Annls. Parsitol. hum. comp. 45:463-476.

1971. Sur deux *Melanoconion* et un novel *Aedinus* de la Guyane Francaise (Dipt. Culicidae). Annls. Soc. Entomol. Fr. (N.S.) 7:629-654.

1972. Description des stades inconnus de *Culex (Mochlostyrax) lacertosus* Komp & Rozeboom, 1951 (Dipt., Culicidae). Annls. Soc. Entomol. Fr. (N. S.) 8:169-178.

Cupp, E. W., W. F. Scherer and J. V. Ordonez
1979. Transmission of Venezuelan Encephalitis virus by naturally infected *Culex (Melanoconion) opisthopus*. Am. J. Trop. Med. Hyg. 28:1060-1063.

Degallier, N., J. P. Digoutte and F. X. Pajot avec la coll. tech. de R. Kramer, J. Claustre, S. Bellony, G.Chatenay et E. Alfre
1978. Epidemiologie de deux arbovirus du complexe VEE en Guyane francaise: donnees preliminaires sur les relations virus-vecteurs. Cah. O.R.S.T.O.M. Ser. Entomol. Med. et Parasitol. 16:209-221.

1979. Epidemiologie de Buyavirus (Arbovirus) des groupes C et Guama en Guyane francaise: donnees preliminaires et comparison avec les virus du complexe VEE. Cah. O.R.S.T.O.M., ser. Entomol. Med. et Parasitol. 17:3-11.

Duret, J. P.
1954. Las especies argentinas de *Culex (Melanoconion)* (Diptera - Culicidae) (Conclusion). Rev. Soc. Entomol. Argent. 16:99-121.

1967a. Dos especies nuevas de *Culex (Melanoconion)* (Diptera - Culicidae). Neotropica 13:77-84.

1968a. *Culex (Melanoconion) kerri* y *C. (M.) cristovao* dos nuevas especies del Brasil (Diptera, Culicidae). Neotropica 14:11-16.

1968b. Cuatro especies nuevas de *Culex* (Diptera, Culicidae). Neotropica 14:57-64.

1968c. *Culex (Melanoconion) contei* una nueva especies del Brasil y Panama (Diptera, Culicidae). Neotropica 14:121-124.

1968d. Dos especies nuevas de *Culex* del Brasil (Diptera, Culicidae). Physis 28:15-19.

1968e. Cinco especies nuevas de *Culex (Melanoconion)* (Diptera, Culicidae). Rev. Soc. Entomol. Argent. 30:69-81.

1969a. Contribucion al conocimiento de los *Culex* del Paraguay (Diptera - Culicidae). Rev. Soc. Ent. Arg., 31:3-13.

1969b. *Culex (Melanoconion) bahiense* una especie nueva del Brasil. Neotropica 15:40-42.

1969c. Estudio sobre *Culex (Melanoconion) ocellatus* y sus especies afines (Diptera, Culicidae). Physis 29:113-129.

Duret, J. P. and M. P. Barreto
1956. Notas sobre culicias do estado de Sao Paulo, Brasil, com descricoes de tres nova especies de *Culex* (Diptera, Culicidae). Revta. Bras. Entomol. 5:81-99.

Dyar, H. G.
1905. Remarks on genitalic genera in the Culicidae. Proc. Entomol. Soc. Wash. 7:42-49.

1918a. A revision of the American species of *Culex* on the male genitalia (Diptera, Culicidae). Insec. Inscit. Menst. 6:86-111.

1918b. New American mosquitoes (Diptera, Culicidae). Insec. Inscit. Menst. 6:120-129.

1923. On some of the American subgenera of *Culex*. Insec. Inscit. Menst. 11:187-190.

1928. The mosquitoes of the Americas. Carnegie Inst. Wash. (Publ. 387), 616 p.

Dyar, H. G. and F. Knab
1906. The larvae of Culicidae classified as independent organisms. J. N. Y. Entomol. Soc. 14:169-230.

Edwards, F. W.
1932. Diptera, Fam. Culicidae. *In* P. Wytsman, Genera Insectorum, Desmet-Verteneuil, Brussels. Fasc. 194, 285 p.

Floch, H. and E. Abonnenc
1947. Distribution des moustiques du genre *Culex* en Guyane Francaise. Publ. Inst. Pasteur Guyane Ter. Inini, No. 146:1-9.

Foote, R. H.
1954. The larvae and pupae of the mosquitoes belonging to the *Culex* subgenera *Melanoconion* and *Mochlostyrax*. Tech. Bull. U. S. Dept. Agric. 1091:1-126.

Galindo, P.
1969. Notes on the systematics of *Culex (Melanoconion) taeniopus* Dyar and Knab and related species, gathered during arbovirus investigation in Panama. Mosq. Syst. Newslett. 1:82-89.

1978. Los Arboviruses de Panama. Rev. Med. de Panama 3:1-41.

Galindo, P. and F. S. Blanton
1954. Nine new species of Neotropical *Culex*, eight from Panama and one from Honduras (Diptera, Culicidae). Ann. Entomol. Soc. Am. 47:231-247.

Galindo, P. and M. A. Grayson
1971. *Culex (Melanoconion) aikenii*: Natural vector in Panama of endemic Venezuelan Encephalitis. Science 172:594-595.

Galindo, P. and E. Mendez
1961. Descriptions of four new species of *Culex* from Panama (Diptera: Culicidae). Ann. Entomol. Soc. Am. 54:1-4.

Galindo, P. and S. Srihongse
1967. Transmission of arboviruses to hamsters by the bite of naturally infected *Culex (Melanoconion)* mosquitoes. Am. J. Trop. Med. Hyg. 16:525-530.

Galindo, P., S. Srihongse, E. de Rodaniche and M. A. Grayson
1966. An ecological survey for arboviruses in Almirante, Panama, 1959-1962. Am. J. Trop. Med. Hyg. 15:385-400.

Harbach, R. E. and K. L. Knight
1980. Taxonomists' Glossary of Mosquito Anatomy. Plexus Publ., Marlton, New Jersey. 415 p.

1981. Corrections and Additions to Taxonomists' Glossary of Mosquito Anatomy. Mosq. Syst. 13(2):201-217.

Howard, L. O., H. G. Dyar and F. Knab
1915. The mosquitoes of North and Central America and the West Indies. Vol. 3. Systematic Description (in two parts). Part 1. Carnegie Inst. Wash. (Publ. 159), 523 p.

Knight, K. L.
1978. Supplement to a catalog of the mosquitoes of the World (Diptera: Culicidae). Thomas Say Found., Entomol. Soc. Am. 6(Suppl.):1-107.

Knight, K. L. and A. Stone.
1977. A catalog of the mosquitoes of the world (Diptera: Culicidae). 2nd Edition. Thomas Say Found., Entomol. Soc. Am. 6:1-611.

Komp, W. H. W.
1935. Notes on the validity of the types of the species in the subgenera *Mochlostyrax* and *Melanoconion* in the U. S. National Museum (Diptera, Culicidae). Proc. Entomol. Soc. Wash. 37:1-11.

Komp, W. H. W. and D. P. Curry
1932. A new *Culex* from Panama (Dipt., Culicidae). Psyche 39:82-84.

Komp, W. H. W. and L. E. Rozeboom
1951. Description of eight new species of *Culex* subgenus *Melanoconion* (Diptera, Culicidae). Proc. Entomol. Soc. Wash. 53:121-137.

Lane, J.
1939. Catalogo dos mosquitos neotropicos, Bol. Biol., Ser. Monogr. 1. 218 p.

1953. Neotropical Culicidae. Vol. 1. Sao Paulo, Univ. 548 p.

Lane, J. and L. Whitman
1943. Novas especies de *Culex* do Brasil (Diptera, Culicidae). Rev. Entomol. 14:389-408.

1951. The subgenus "*Microculex*" in Brazil (Diptera, Culicidae). Revta. Bras. Biol. 11:341-366.

Peryassu, A. G.
1908. Os culicideos do Brazil. Inst. Manguinhos, Rio de Janeiro, Brazil. 407 p.

Rozeboom, L. E. and W. H. W. Komp
1950. A review of the species of *Culex* of the subgenus *Melanoconion* (Diptera, Culicidae). Ann. Entomol. Soc. Am. 43:75-114.

Senevet, G. and E. Abonnenc
1939. Los moustiques de la Guyane Francaise -- II. Le genre *Culex*. Arch. Inst. Pasteur Alger. 17:62-134.

Sirivanakarn, S.
1972. Contributions to the mosquito fauna of Southeast Asia. XIII. The genus *Culex*, subgenus *Eumelanomyia* Theobald in Southeast Asia and adjacent areas. Contrib. Am. Entomol. Inst. (Ann Arbor) 8(6):1-86.

1977. Medical Entomology Studies. VI. A revision of the subgenus *Lophoceraomyia* of the genus *Culex* in the Oriental region (Diptera: Culicidae). Contrib. Am. Entomol. Inst. (Ann Arbor) 13(4):1-245.

1978a. Revalidation of *Culex (Melanoconion) invocator* Pazos with a redescription of adults and illustration of male genitalia (Diptera: Culicidae). Mosq. Syst. 10:239-245.

1978b. The female cibarial armature of New World *Culex*, subgenus *Melanoconion* and related subgenera with notes on this character in subgenera *Culex*, *Lutzia* and *Neoculex* and genera *Galindomyia* and *Deinocerites* (Diptera: Culicidae). Mosq. Syst. 10:474-492.

1979. A new species of *Culex (Melanoconion)* from Bolivia and Ecuador (Diptera: Culicidae). Mosq. Syst. 11:135-137.

Sirivanakarn, S. and J. N. Belkin
1980. The identity of *Culex (Melanoconion) taeniopus* Dyar and Knab and related species with notes on the synonymy and description of a new species (Diptera: Culicidae). Mosq. Syst. 12:7-24.

Sirivanakarn, S. and N. Degallier
1981. Redescription of *Culex (Melanoconion) portesi* Senevet and Abonnenc 1941 (Diptera: Culicidae). Mosq. Syst. 13:153-167.

Sirivanakarn, S. and P. Galindo
1980. A new species of *Culex (Melanoconion)* from Panama (Diptera: Culicidae). Mosq. Syst. 12:25-34.

Sirivanakarn, S. and S. J. Heinemann
1980. Description of the hitherto unknown adults and pupa, and additional description of the larva of *Culex (Melanoconion) simulator* Dyar and Knab (Diptera: Culicidae). Mosq. Syst. 12:41-49.

Sirivanakarn, S. and W. L. Jakob
1979. A new species of *Culex (Melanoconion)* from southern Brazil (Diptera: Culicidae). Mosq. Syst. 11:139-143.

1981a. *Culex (Melanoconion) sacchettae*, a new species from the state of Sao Paulo, Brazil (Diptera: Culicidae). Mosq. Syst. 13:191-194.

1981b. Notes on the distribution of *Culex (Melanoconion)* mosquitoes in northeastern Argentina (Diptera: Culicidae). Mosq. Syst. 13:195-200.

Smith, H. M.
1970. Nomina and Taxa Dubia. Syst. Zool. 19:94.

Stone, A., K. L. Knight and H. Starcke
1959. A synoptic catalog of the mosquitoes of the world (Diptera, Culicidae). The Thomas Say Found. Entomol. Soc. Am. Vol. 6, 358 p.

Theobald, F. V.
1903. A monograph of the Culicidae or mosquitoes. Vol. 3. London Brit. Mus. Nat. Hist. 359 p.

1905. New Culicidae from India, Africa, British Guiana, and Australia. J. Econ. Biol. 1:17-36.

Valencia, J. D.
1973. Mosquito Studies (Diptera, Culicidae). XXXI. A revision of the subgenus *Carrollia* of *Culex*. Contrib. Am. Entomol. Inst. (Ann Arbor) 9(4):1-134.

FIG. 2

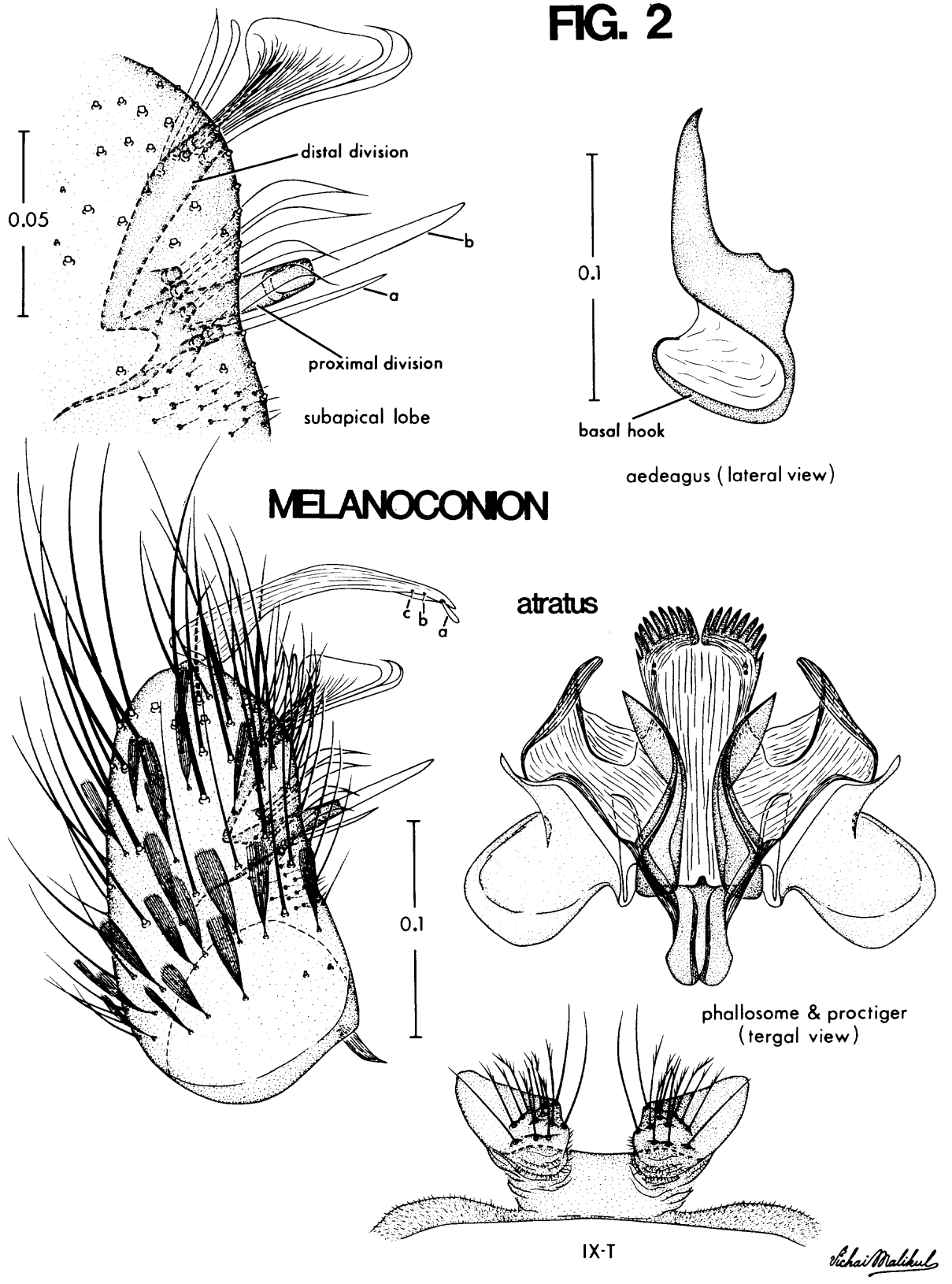
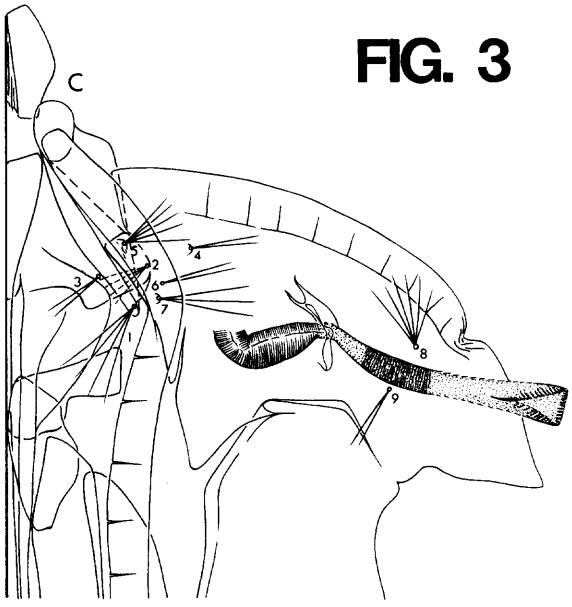
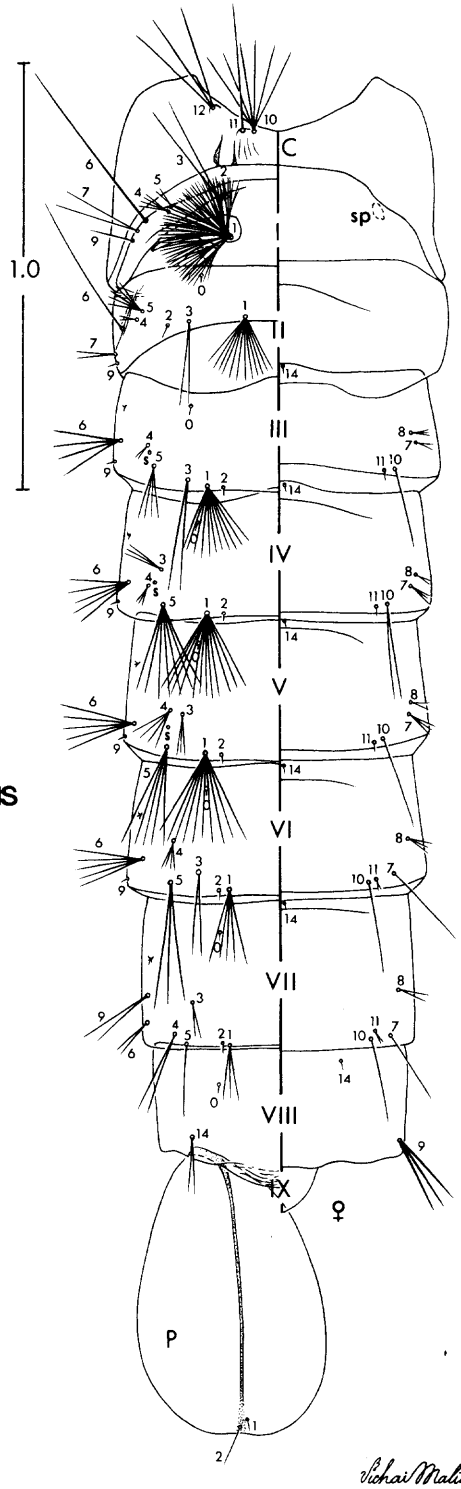

0.05
distal division
b
a
proximal division
subapical lobe
0.1
basal hook
aedeagus (lateral view)
MELANOCONION
atratus
c
b
a
0.1
phallosome & proctiger
(tergal view)
IX-T
Vichai Malikul

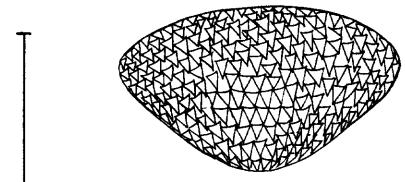
FIG. 3





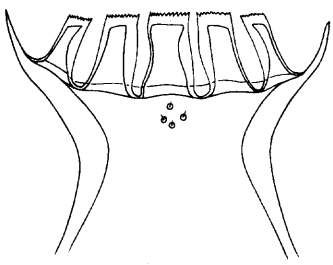
MELANOCONION

atratus



cibarial dome

1.0



cibarial amature

Vichai Malikul

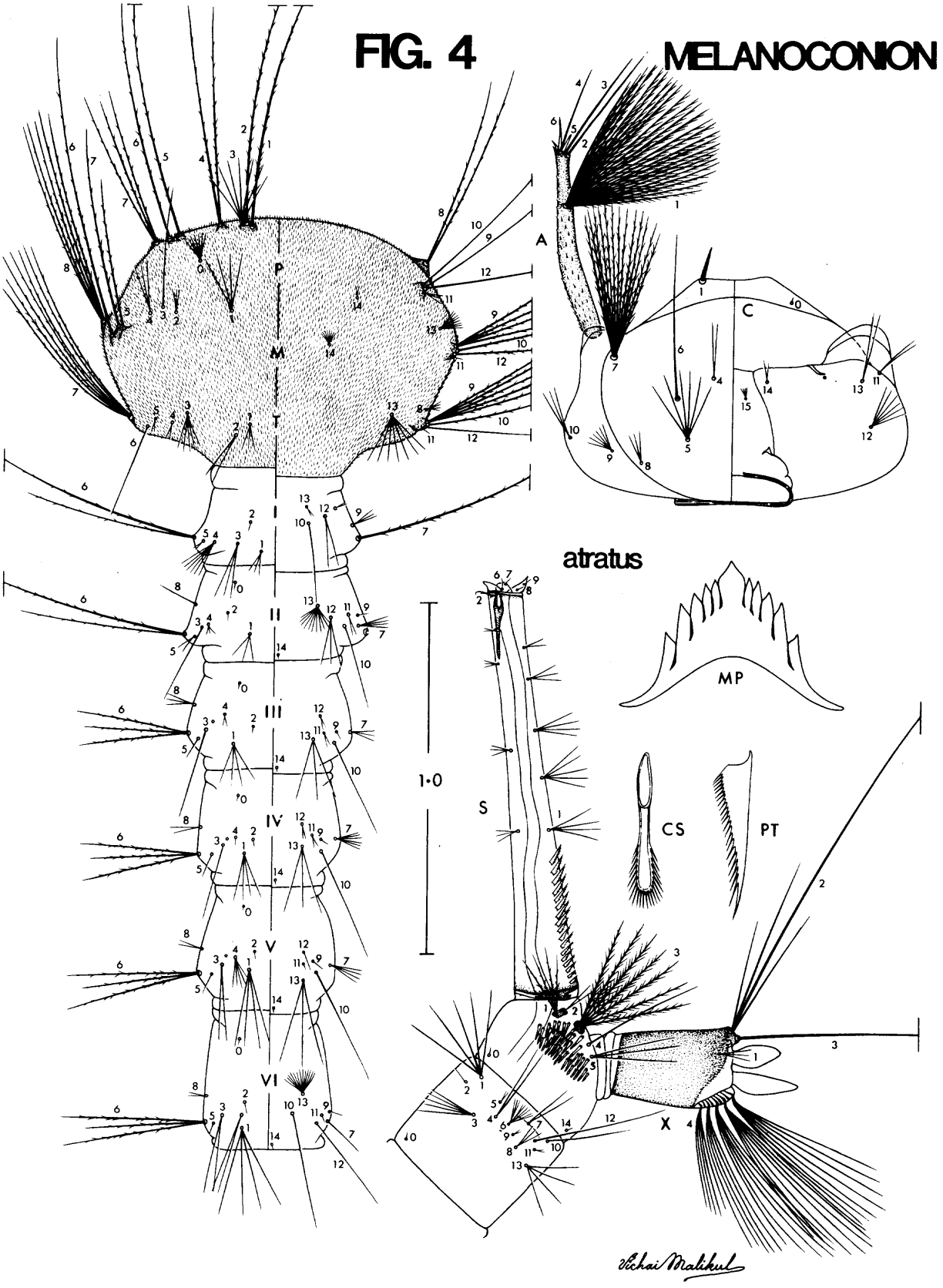
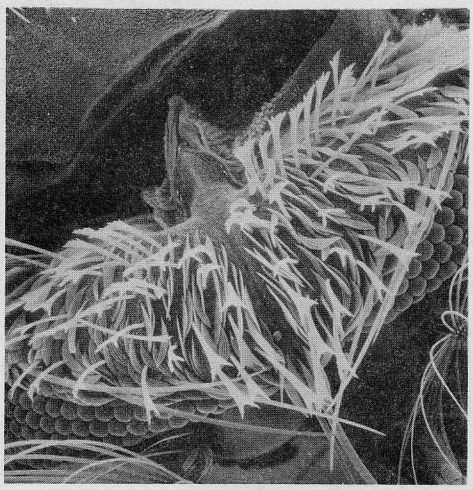
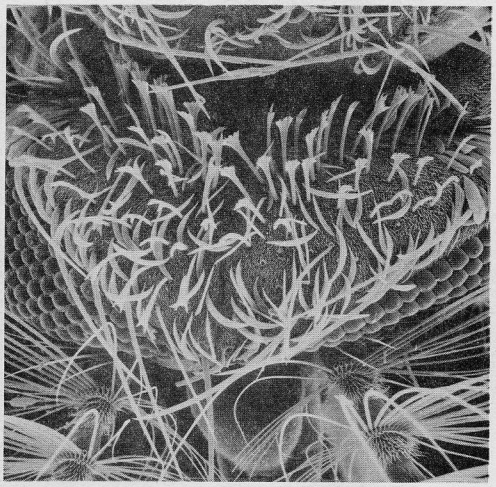


FIG. 4
MELANOCONION
atratus
A
C
P
M
T
I
II
III
IV
V
VI
S
CS
PT
MP
X
1·0

FIG. 5 Types of Decumbent Scales on Vertex of the Head

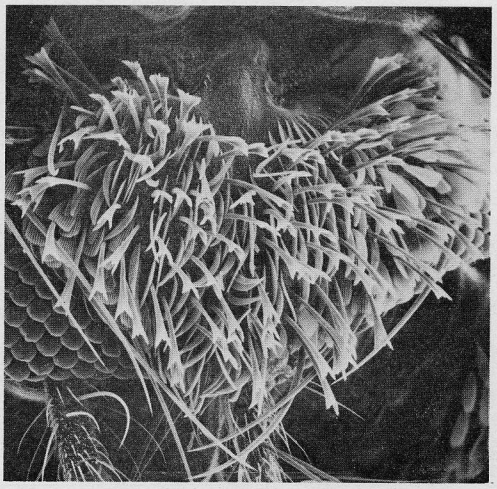


A ocellatus

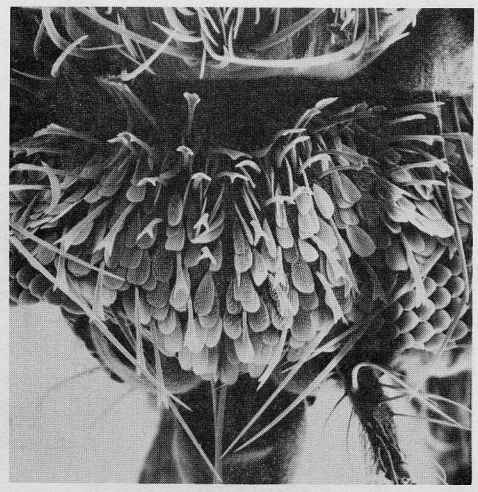


B taeniopus

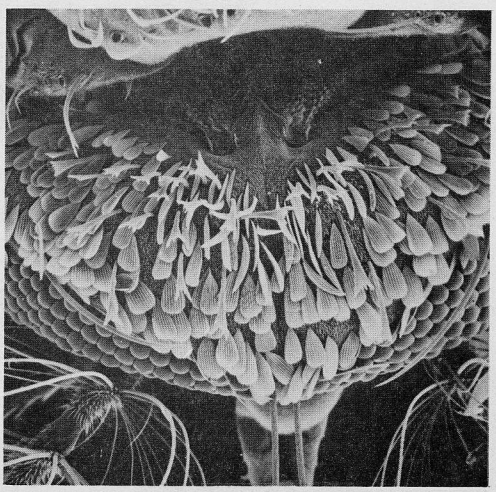
C ocossa



D chrysonotum



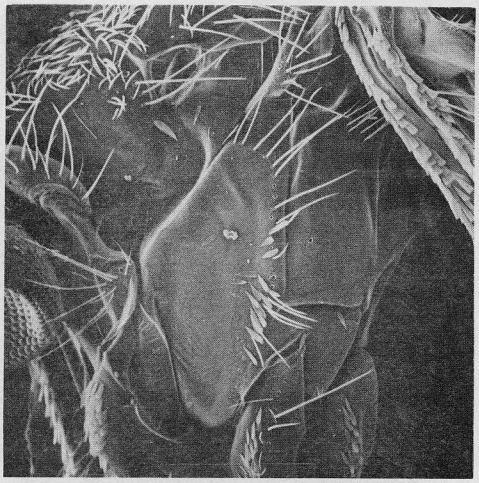
E conspirator



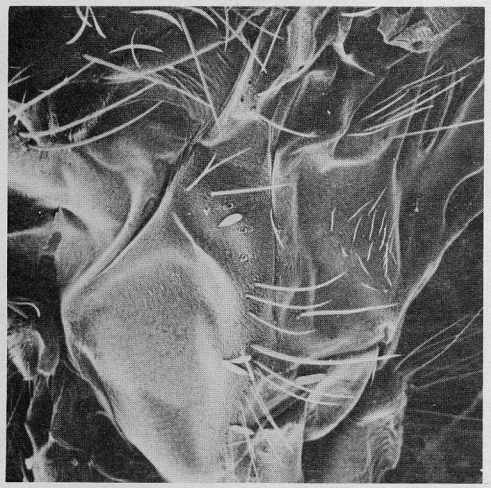
F elephas

FIG. 6 Thorax : Pleural Scale Patches

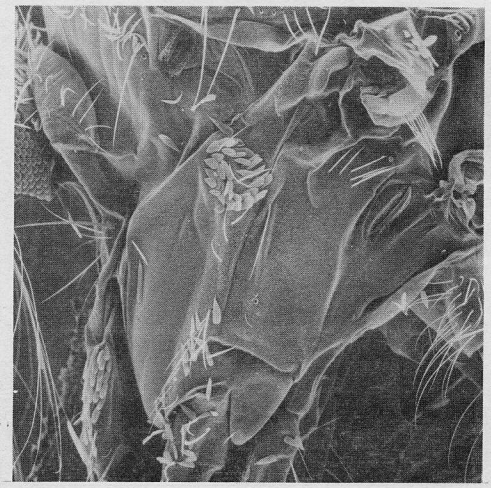
A ocellatus



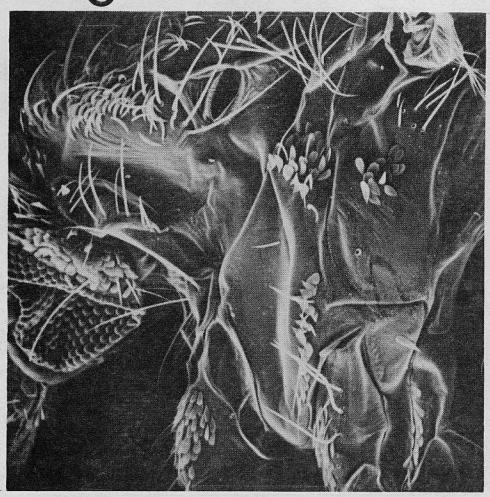
B spissipes



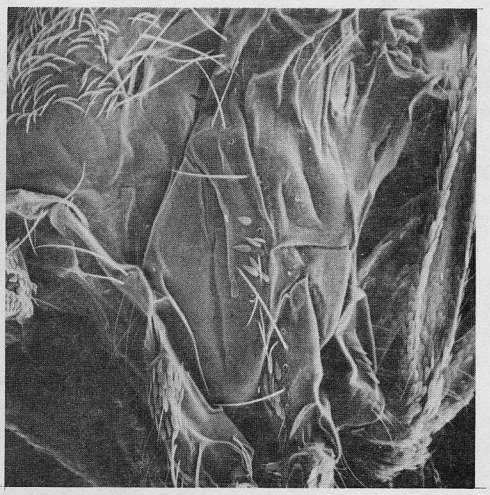
C vomerifer



D dunni



E erraticus



F conspirator

FIG. 7 Types of Plume Scales of the Wing

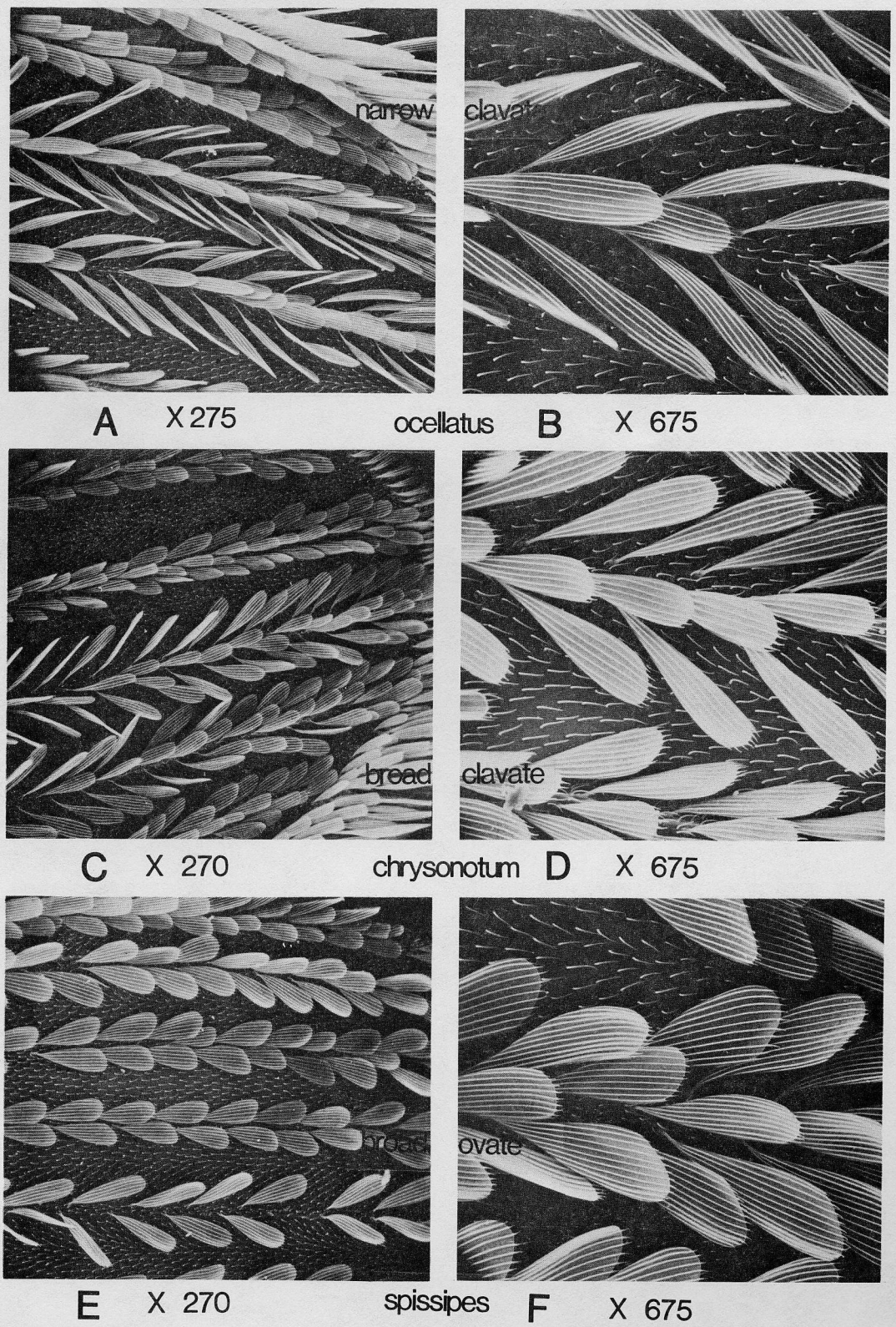


FIG. 8

Female Cibarial Armature

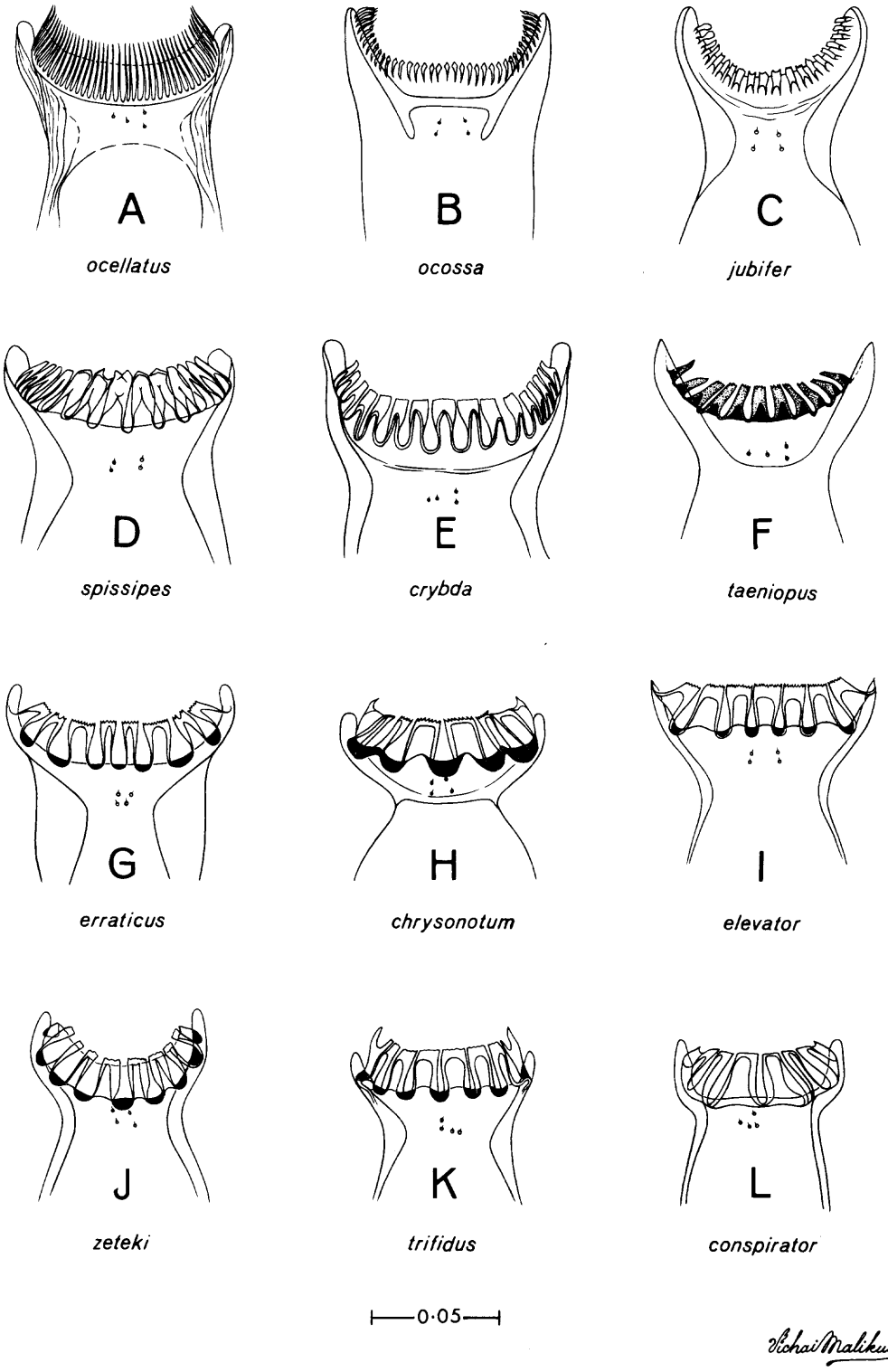


FIG. 9

Female Cibarial Armature

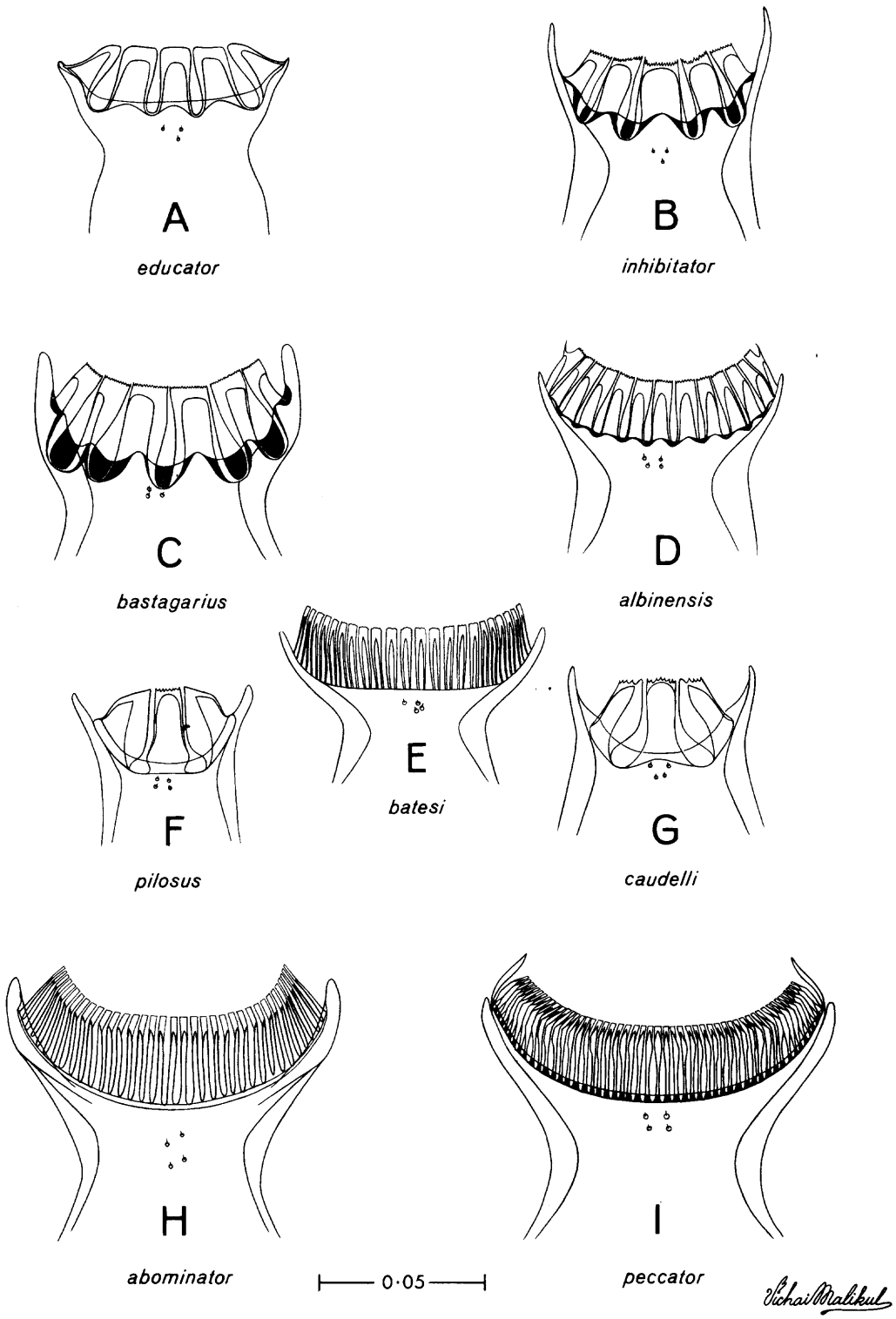


FIG. 10 Male Genitalia : Lateral Plate of aedeagus

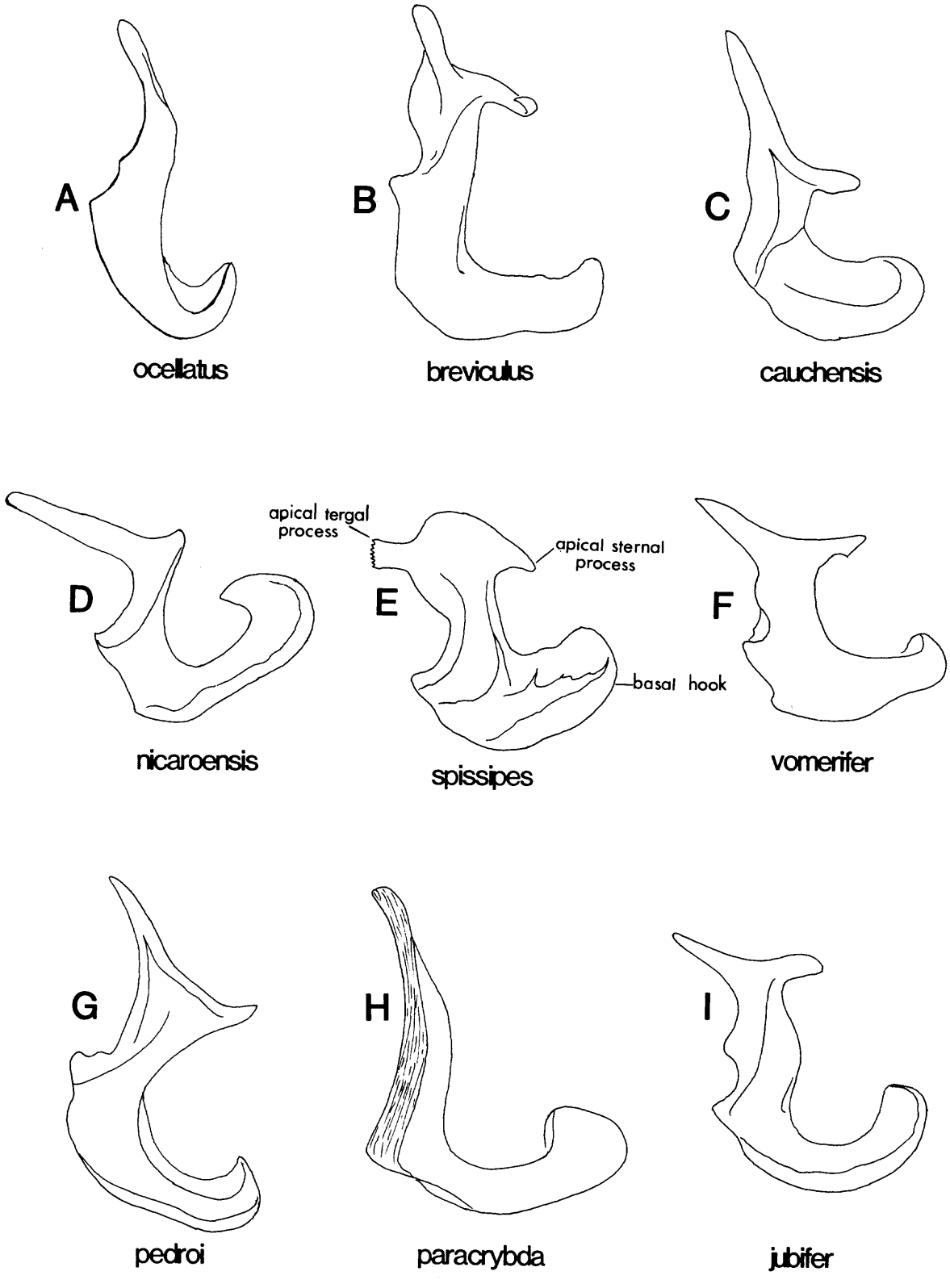


FIG. 11 Male Genitalia : Lateral Plate of aedeagus

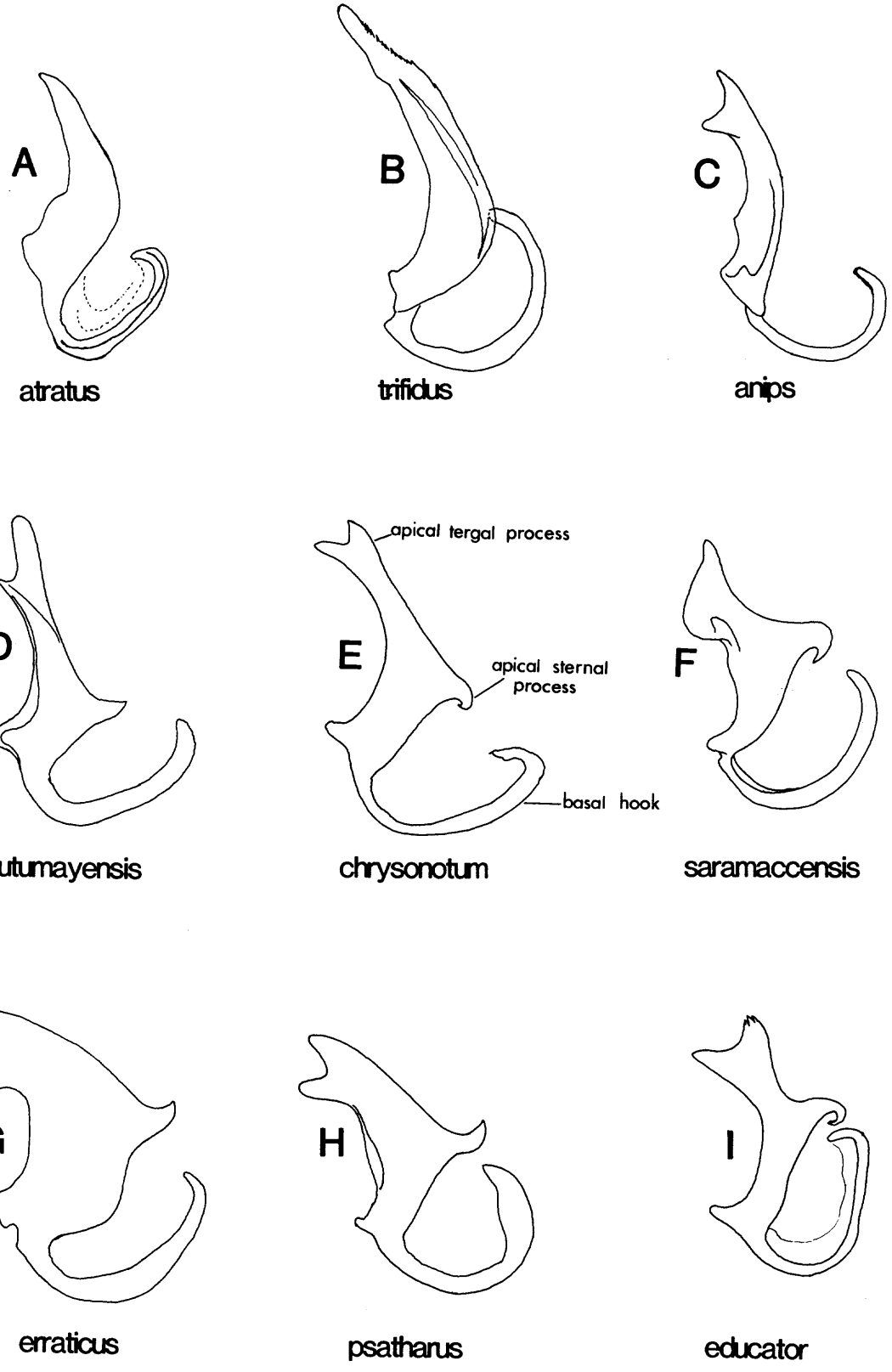


FIG. 12 Male Genitalia : Lateral Plate of aedeagus

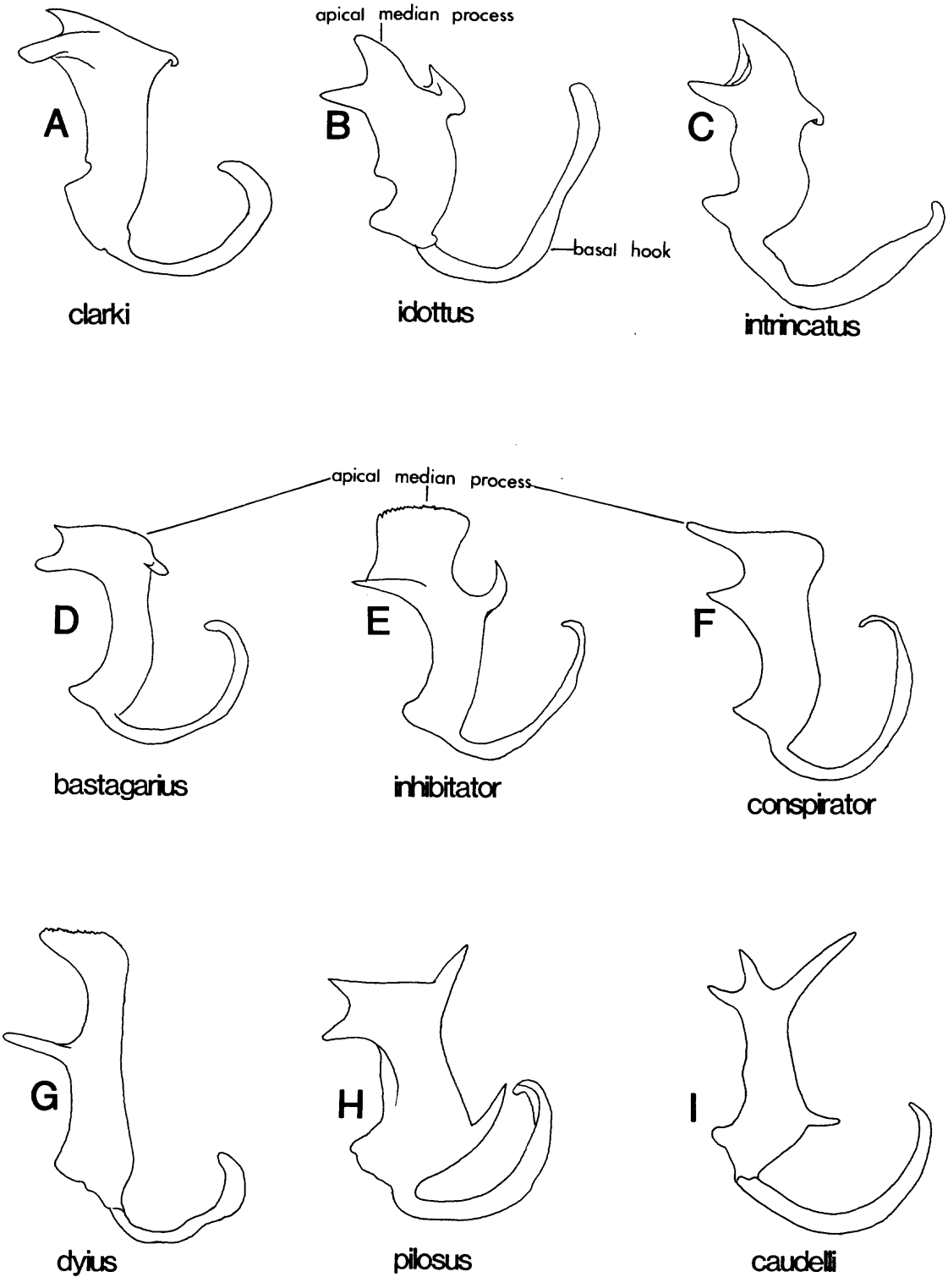


FIG. 13 Male Genitalia : Gonocoxite

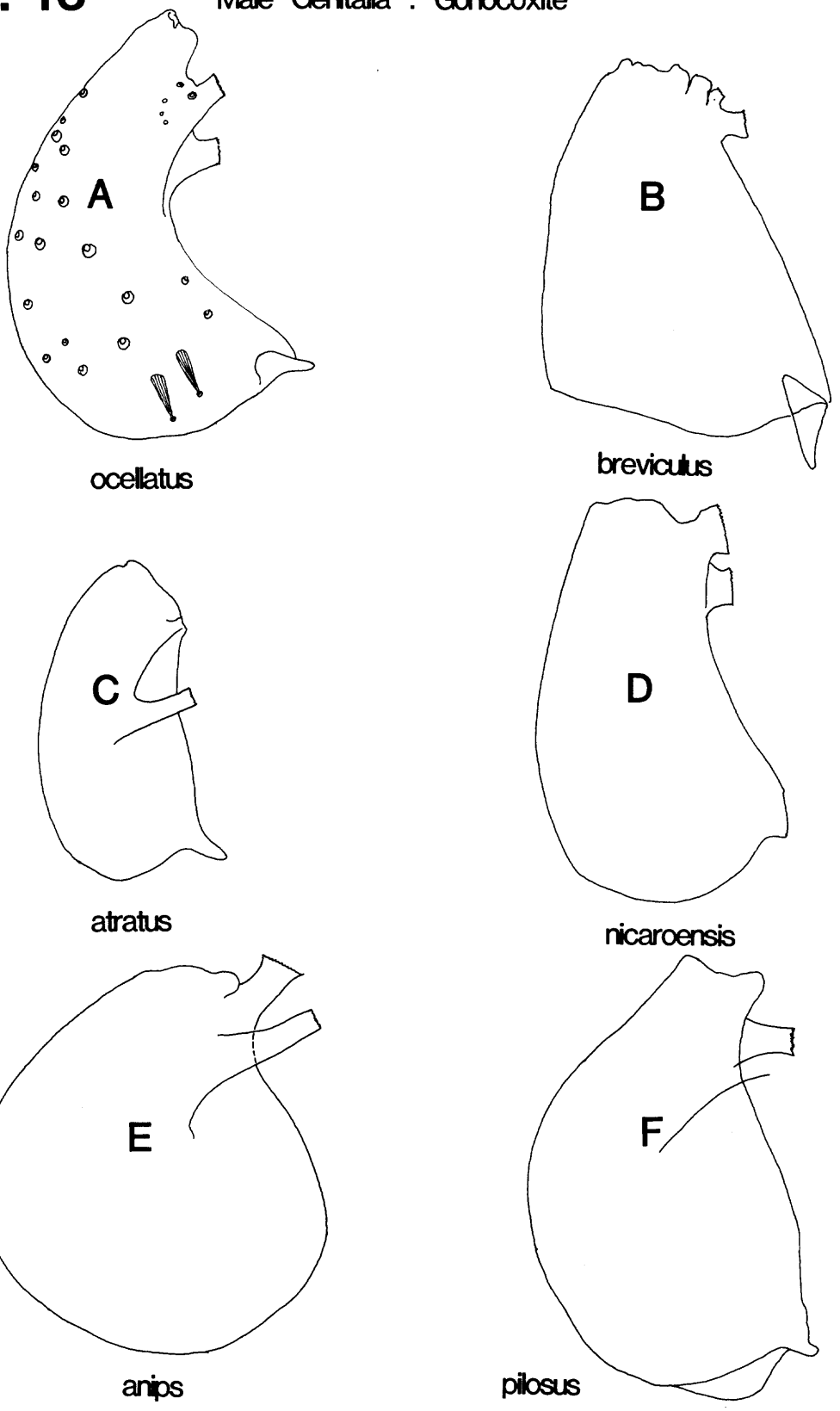


FIG. 14 Male Genitalia : Subapical Lobe

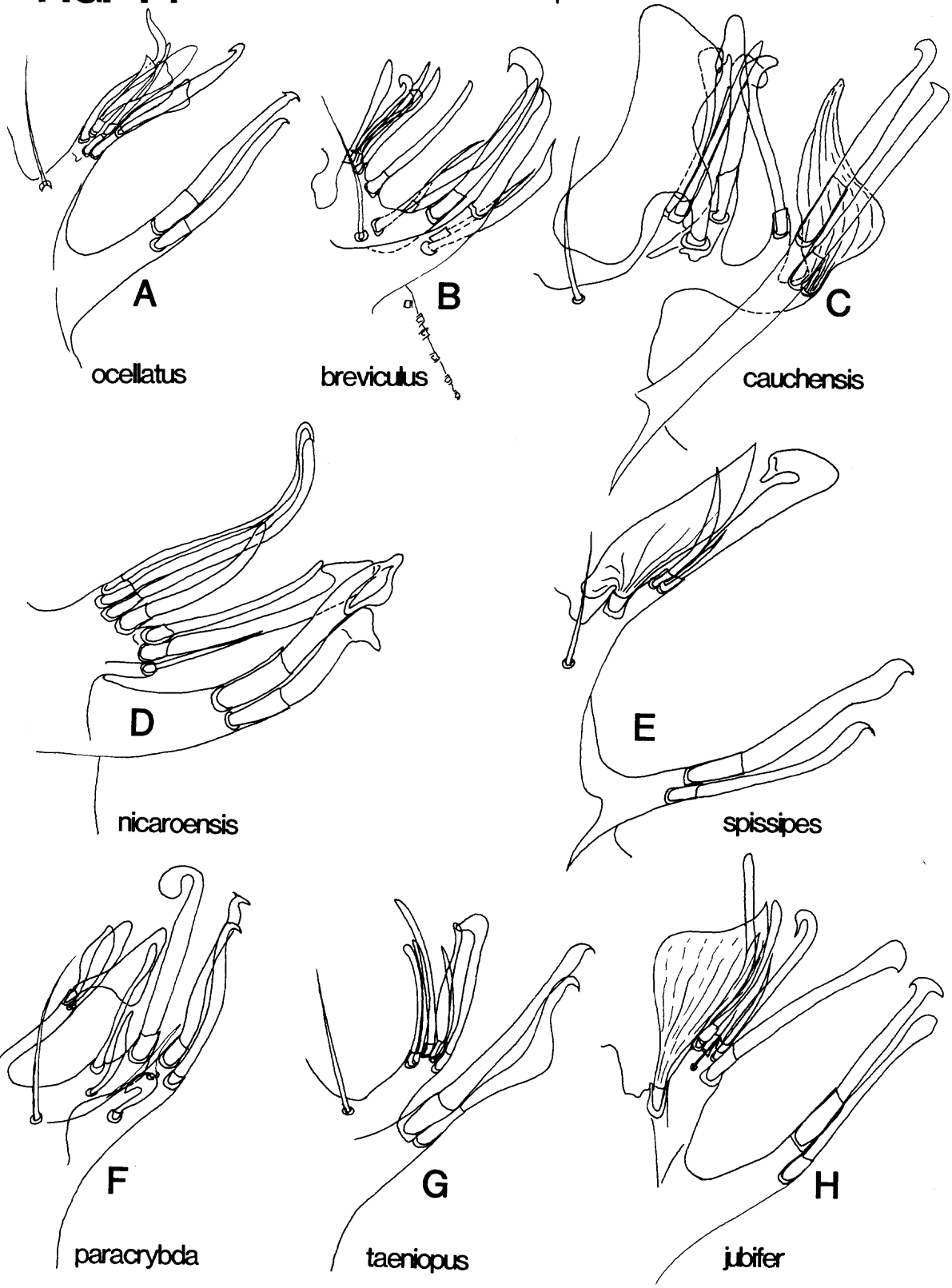


FIG. 15 Male Genitalia : Subapical Lobe

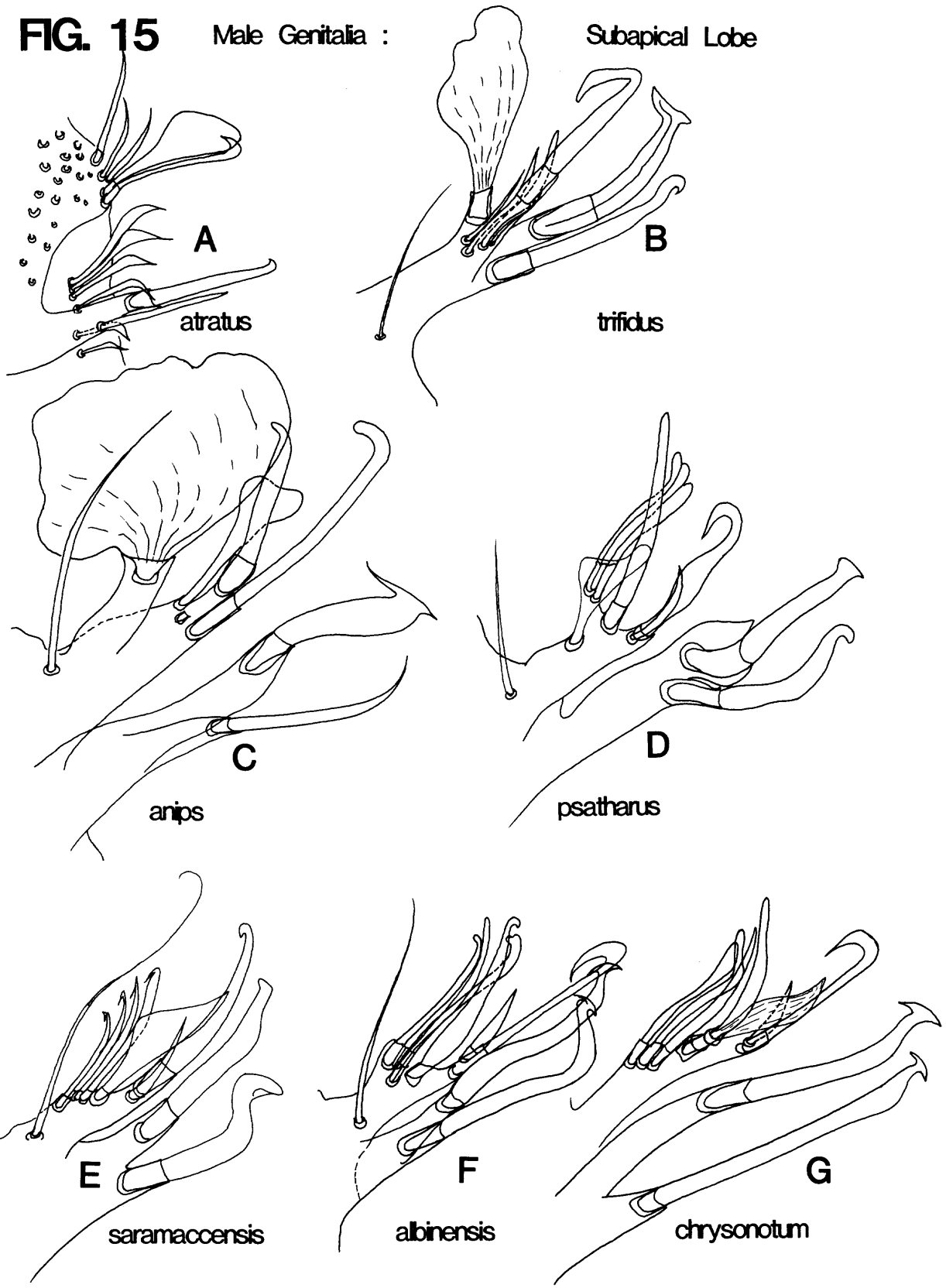


FIG. 16 Male Genitalia : Subapical Lobe

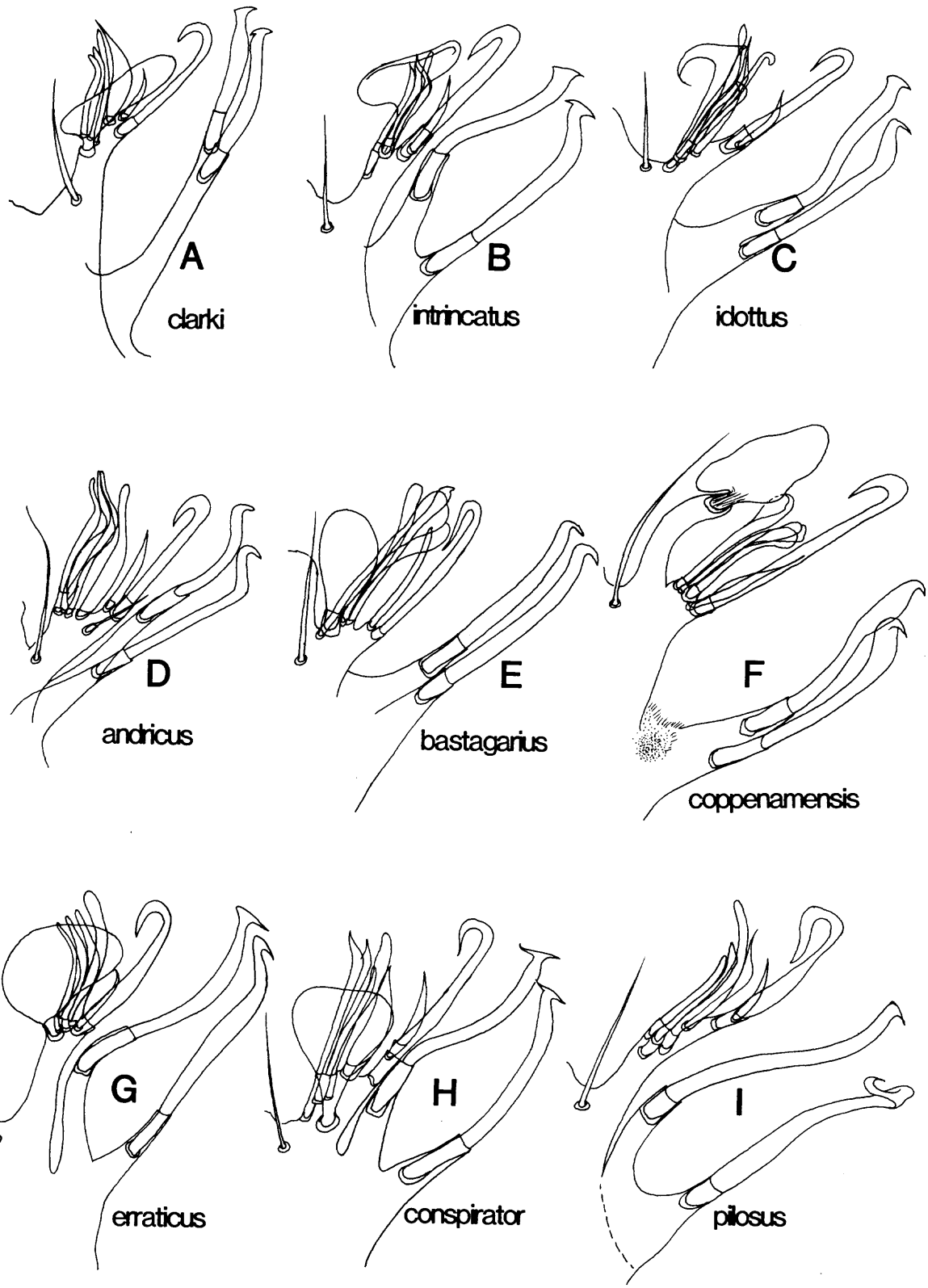


FIG. 17 Male Genitalia : Gonostylus

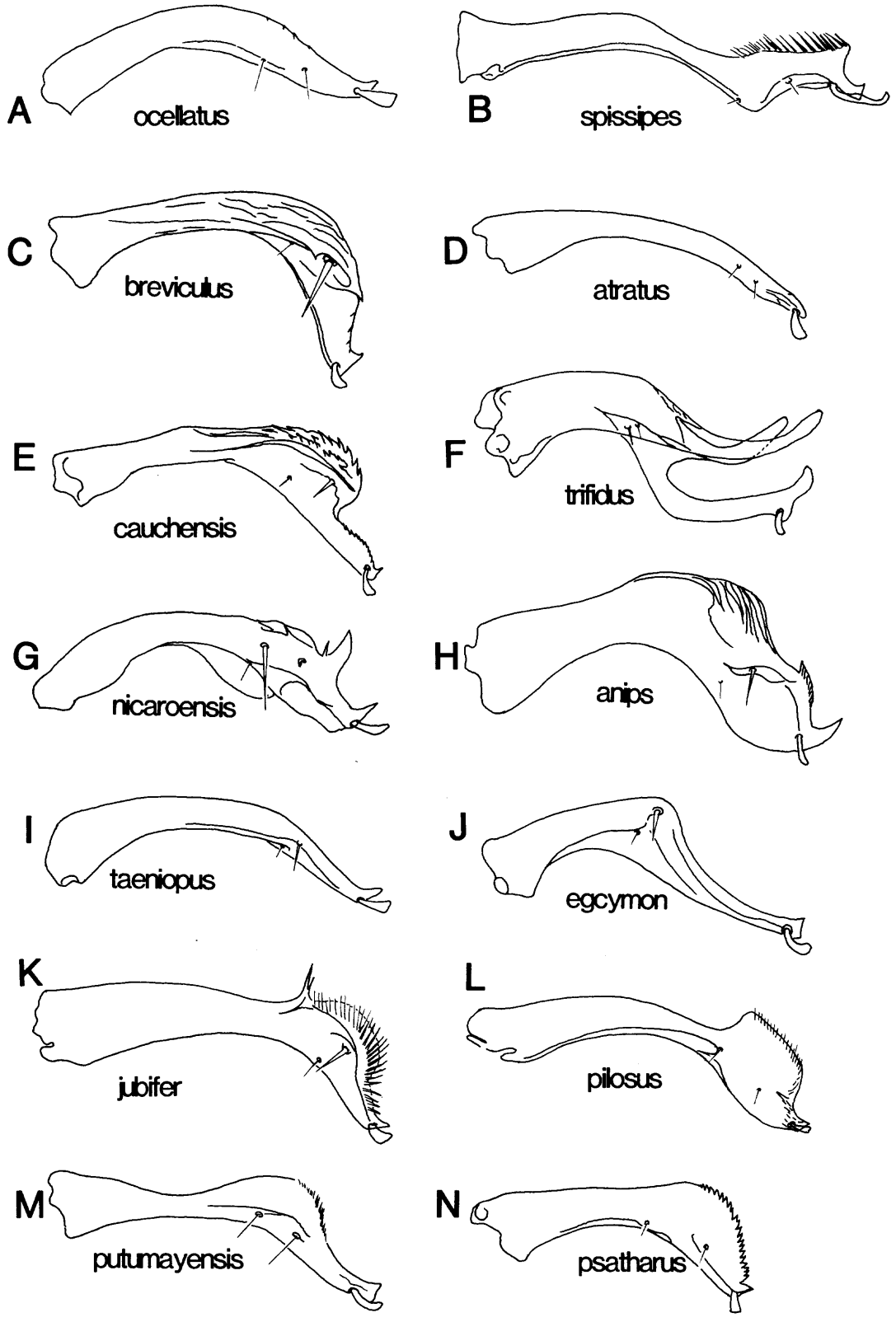


FIG. 18 Male Genitalia : Gonostylus

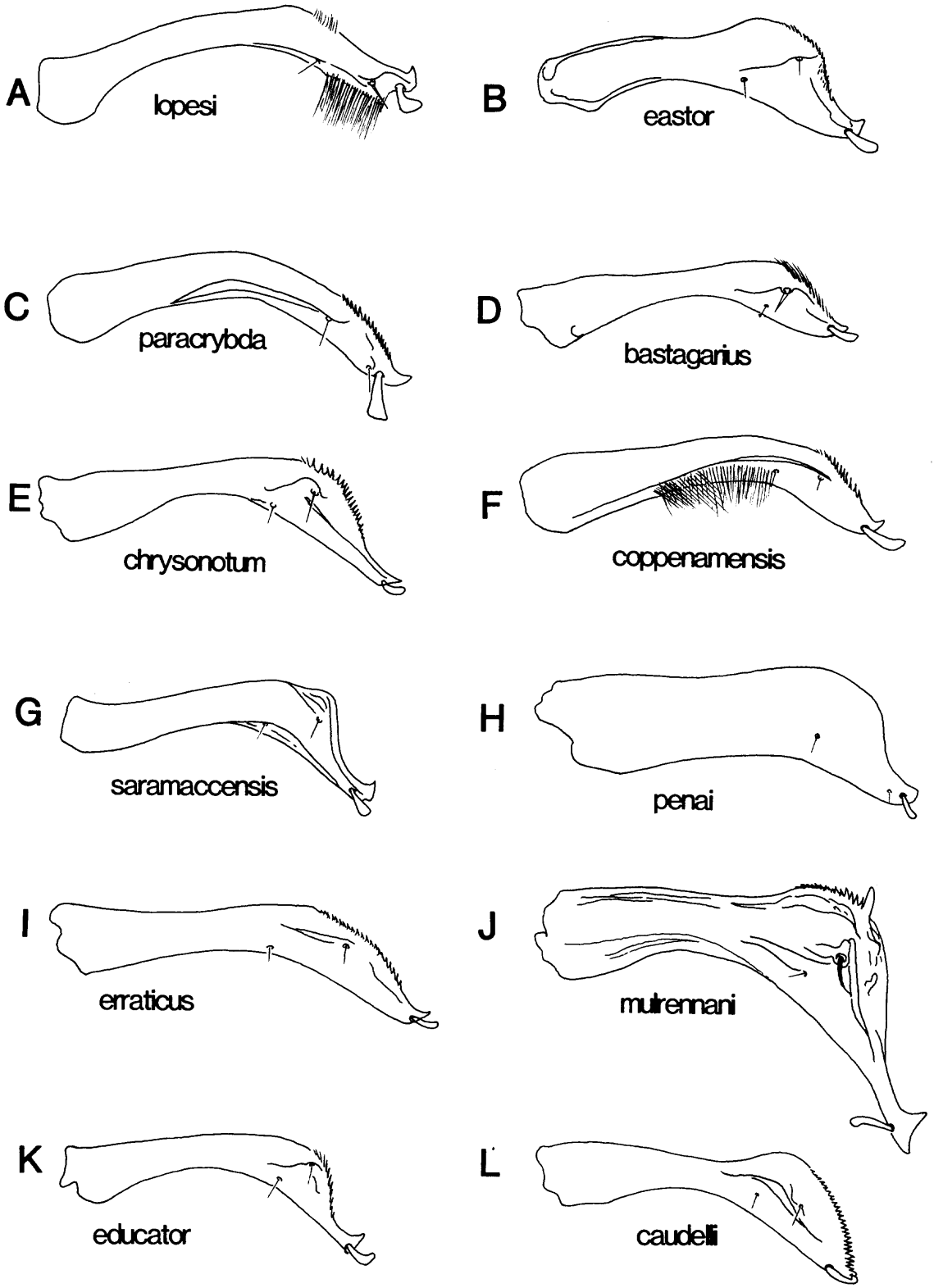
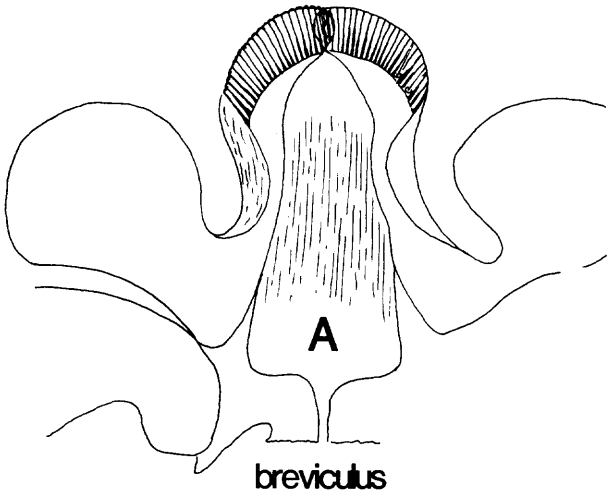
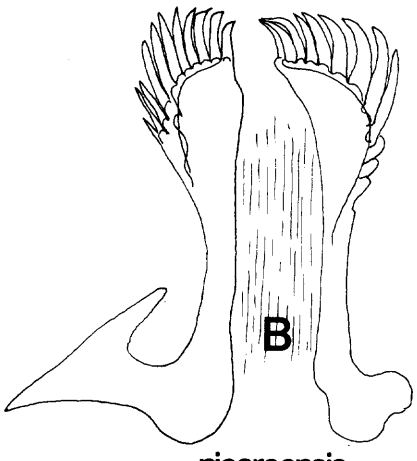


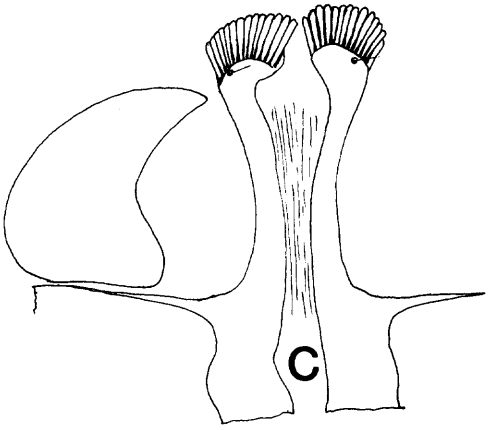
FIG. 19 Male Genitalia : Proctiger Crown



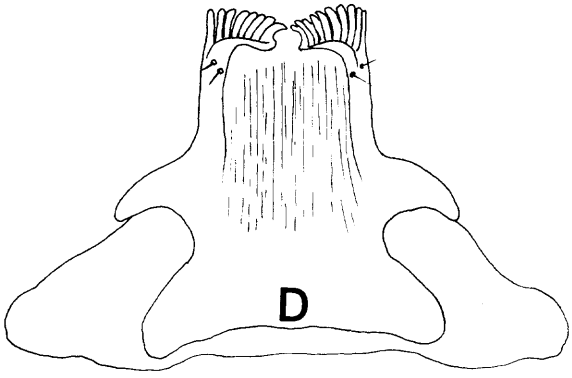
breviculus



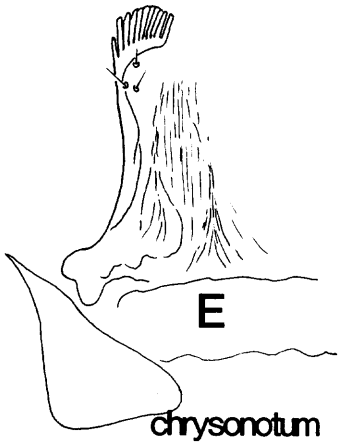
nicaroensis



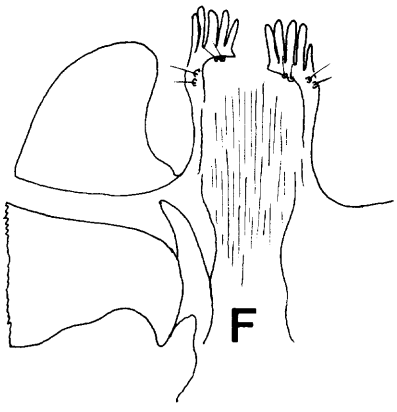
trifidus



jubifer



chrysonotum



ocellatus

FIG. 20 Male Genitalia : Lobe of IX Tergu..

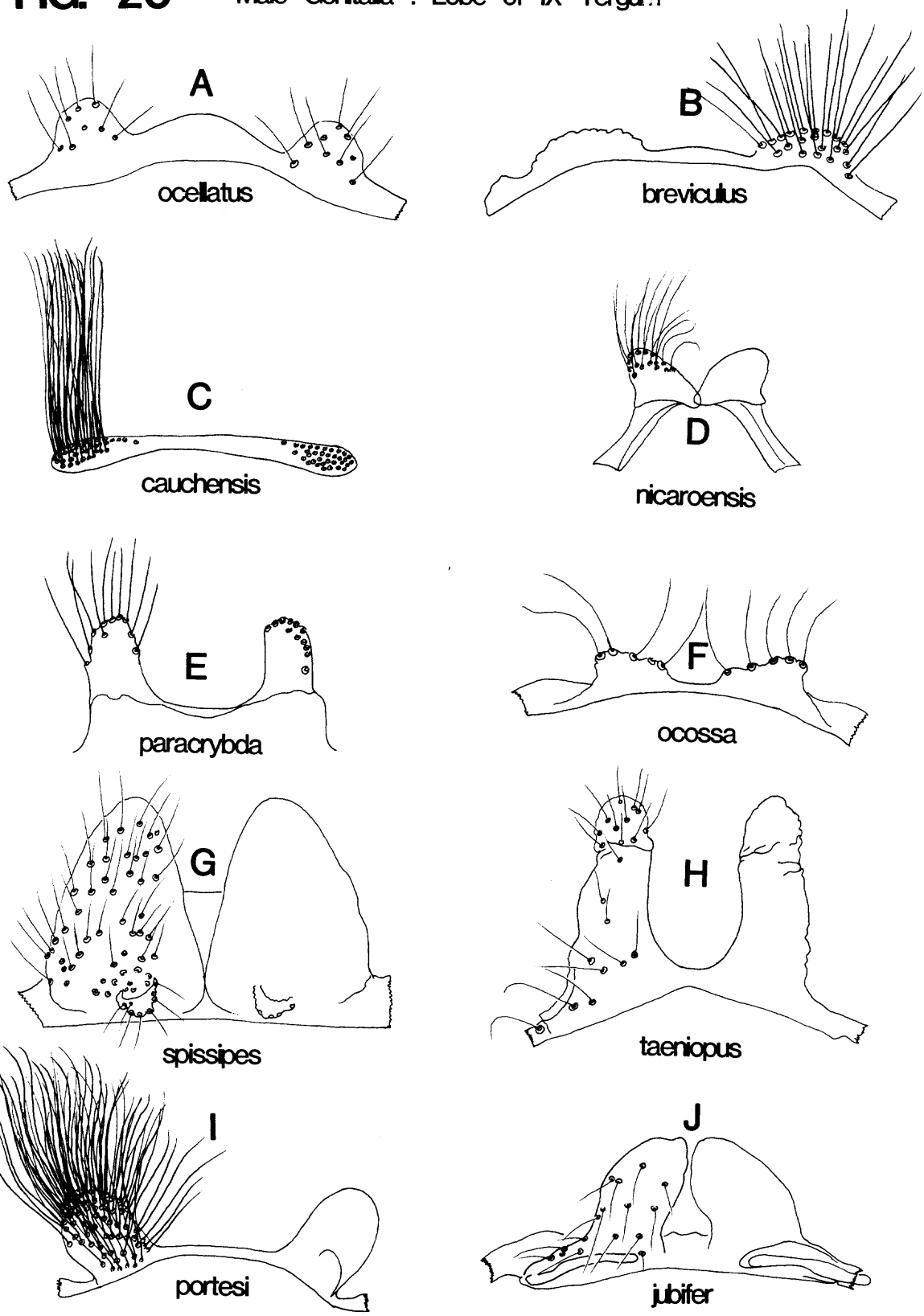


FIG. 21 Male Genitalia : Lobe of IX Tergum

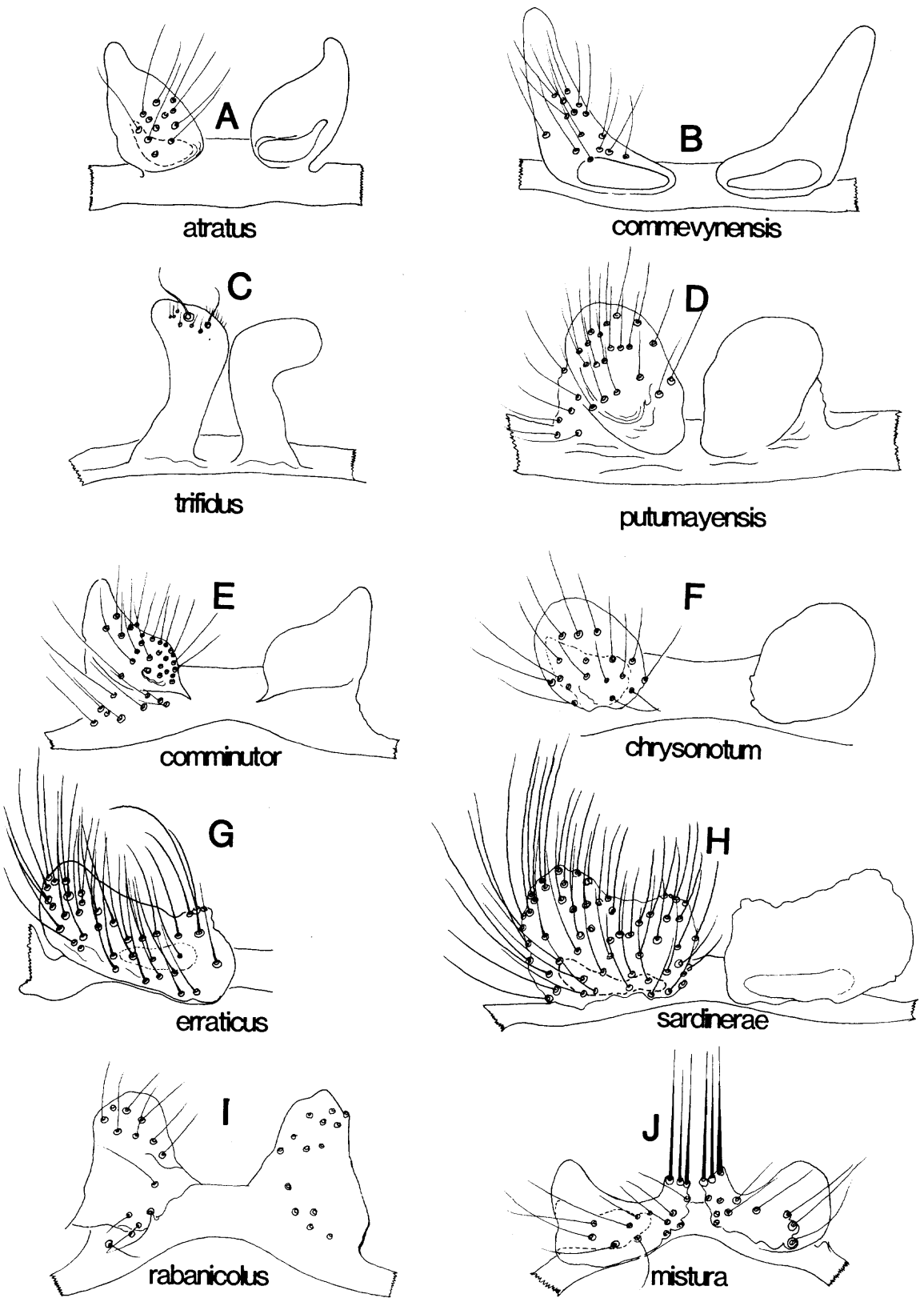


FIG. 22 Male Genitalia : Lobe of IX Tergum

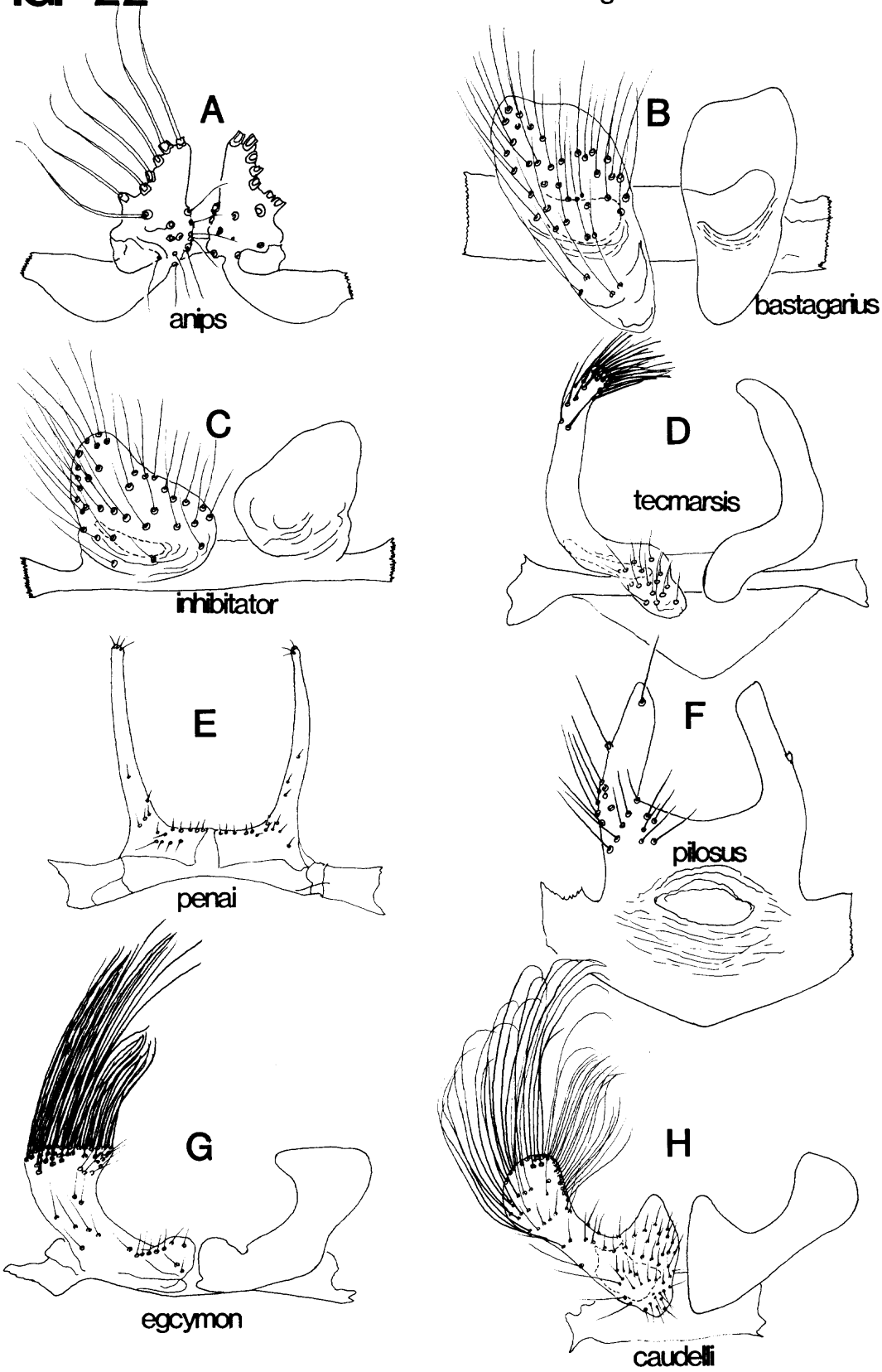


FIG. 23

CULEX (MELANOCONION)

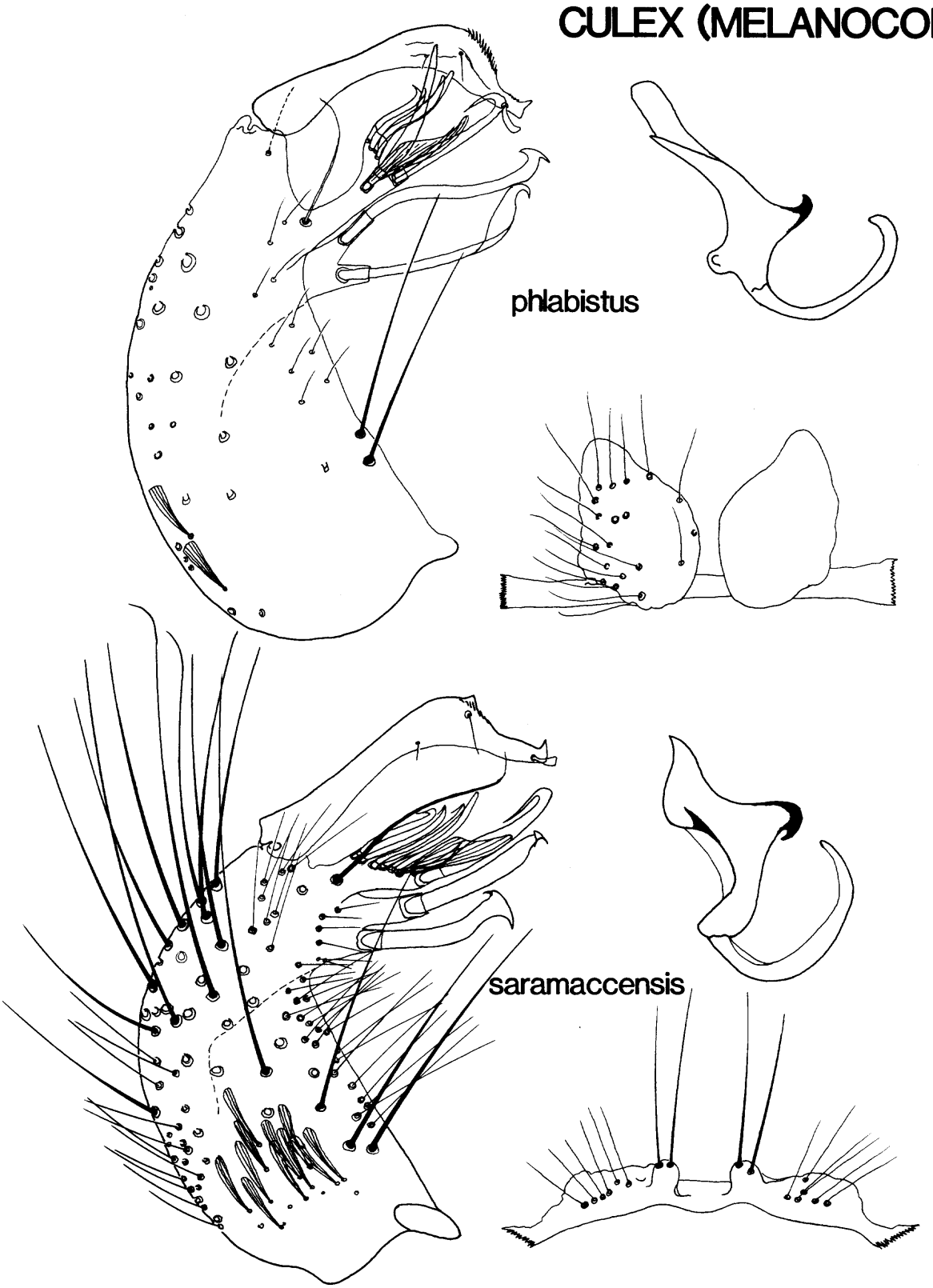
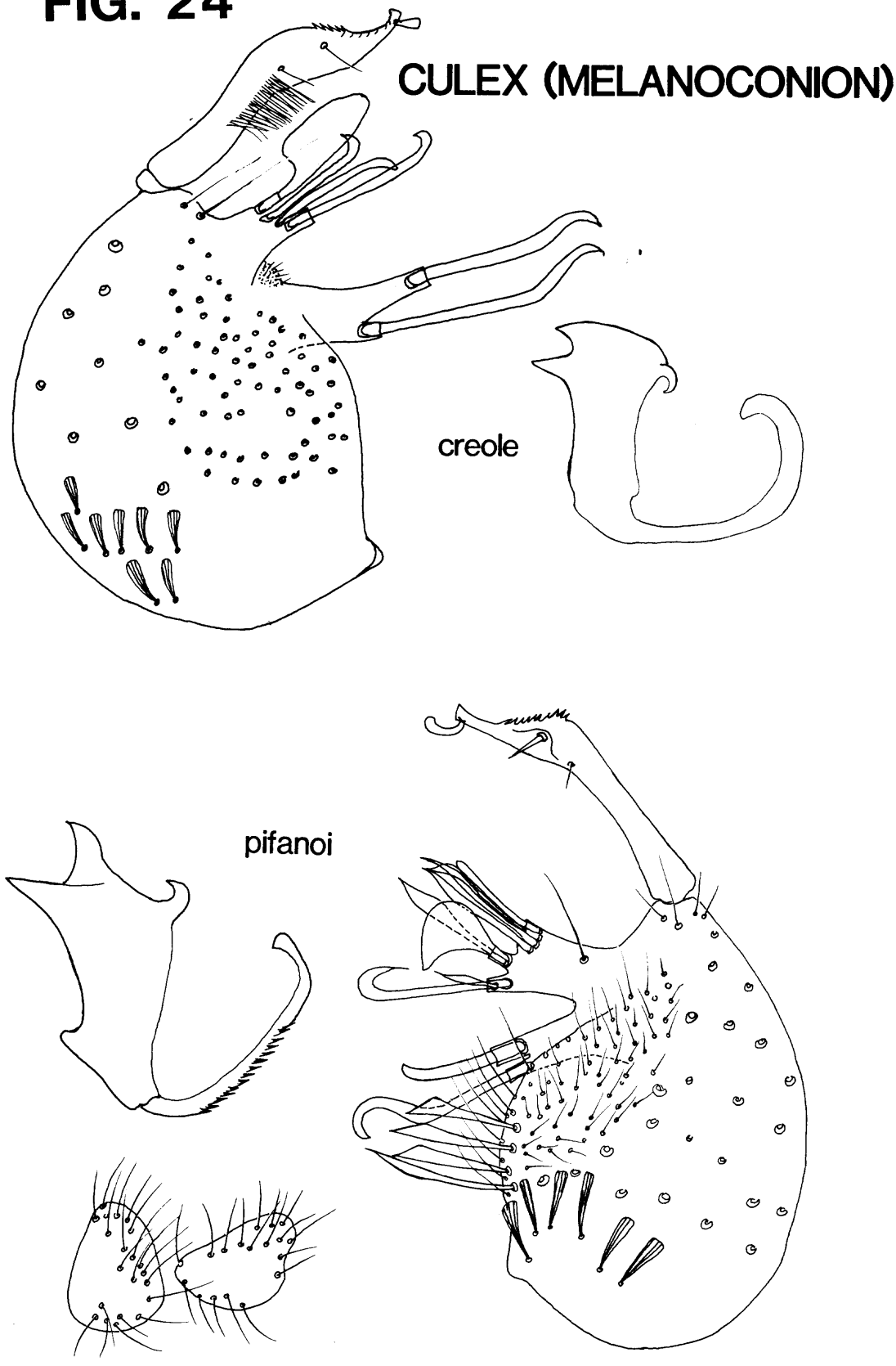


FIG. 24



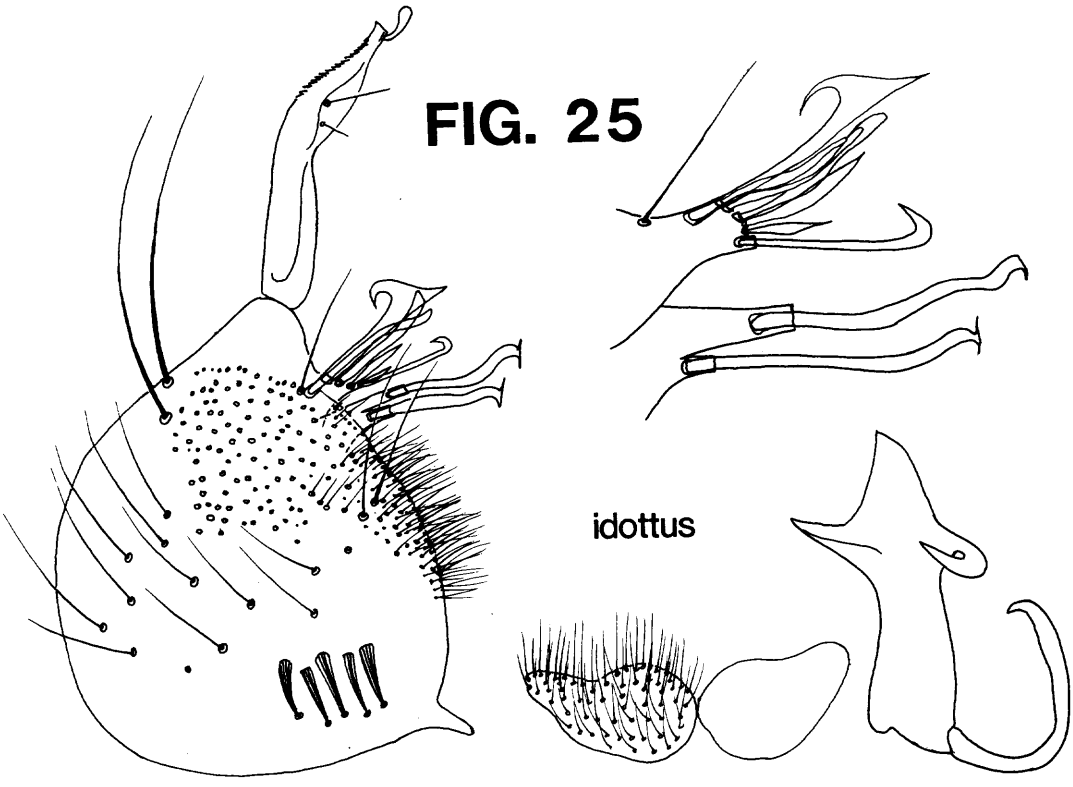
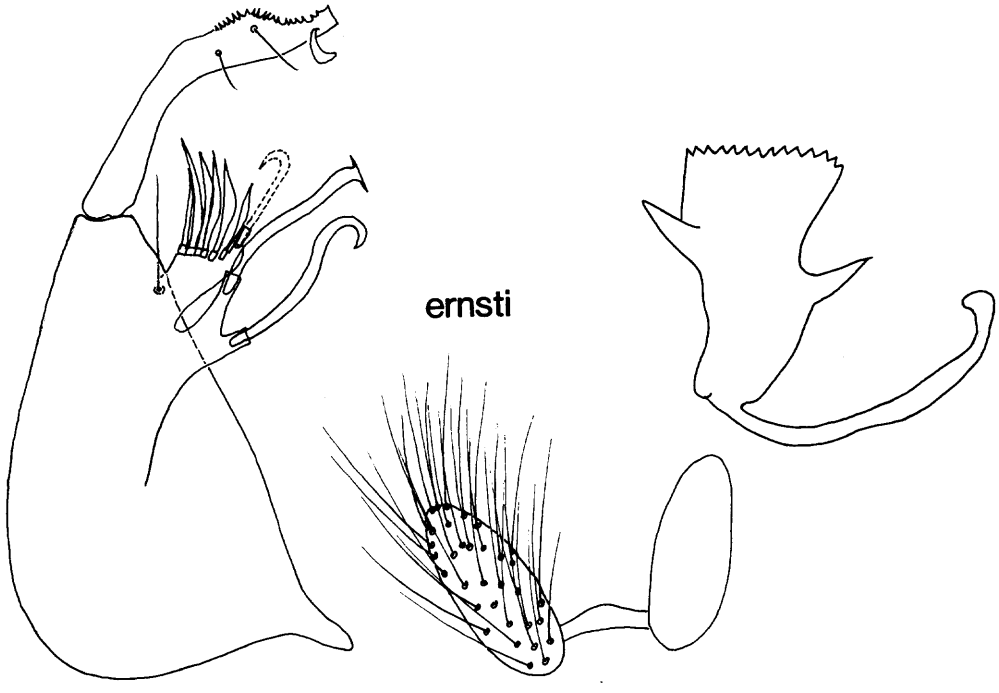


FIG. 25

CULEX (MELANOCONION)



APPENDIX

CONSPECTUS OF TAXONOMIC CHANGES

Transferred Taxa

breviculus Senevet & Abonnenc 1939, from subgenus *Melanoconion* Theobald 1903 to subgenus *Tinolestes* Coquillett 1906
cauchensis Floch & Abonnenc 1945, from subgenus *Melanoconion* Theobald 1903 to subgenus *Tinolestes* Coquillett 1906

Rejected Names

Taxa Dubia: *decorator* Dyar & Knab 1906; *fasciolatus* (Lutz 1904); *gravitator* Dyar & Knab 1906; *humilis* Theobald 1901; *indecorabilis* (Theobald 1903); *lugens* Lutz 1905; *nigrescens* (Theobald 1907) and *nigricorpus* (Theobald 1901).

Nomina Dubia: *chrysothorax* (Peryassu 1908); *epirus* Aiken 1909 and *Asebeomyia* Aiken 1911.

New Synonymy

kerri Duret 1968, to synonymy with *phlabistus* Dyar 1920
seneveti Clastrier 1970, to synonymy with *contei* Duret 1968
thomasi Evans 1924, to synonymy with *bastagarius* Dyar & Knab 1906
venezuelensis Anduze 1948(1949), to synonymy with *simulator* Dyar & Knab 1906

Transferred Synonymy

implicatus Senevet & Abonnenc 1939, from synonymy with *nigrescens* (Theobald 1907) to synonymy with *saramaccensis* Bonne-Wepster & Bonne 1919(1920).